432 Cony Road
P.O. Box 4687
Augusta, ME 04330

ENGINEERING
E.S. COFFIN
SURVEYING
E.S. COFFIN ENGINEERING & SURVEYING, INC.

(207) 623-9475
Fax (207) 623-0016
1-800-244-9475

January 15, 2015

City of Augusta
Mr. Lionel Cayer, City Engineer
One City Center
Augusta, Maine 04330

Subject: Stormwater Report
BADJ Properties, LLC.
79 Lipman Road

Dear Lionel,

E.S. Coffin Engineering & Surveying has completed the hydrologic calculations for BADJ Properties, LLC. for their project located at 79 Lipman Road in Augusta. The parcel of land is identified as lot 22 on tax map 53 in the City of Augusta tax maps. The six acre parcel is located at 79 Dalton Road and is on the east side of the road. The applicant is proposing to develop the parcel into a staging area for processing scrap metal. Scrap metal will be trucked to the site and then sorted before being put on rail cars to be transported out of the state.

This project must comply with the Industrial Stormwater standards of the Department of Environmental Protection (DEP). These rules deal with not allowing dirty water to leave the site. We have incorporated a grease/oil separator on the site to comply with the DEP. The City of Augusta's Land Use Ordinance states that the amount of flow (stormwater) in the post-development condition must be equal to or less then the flow in the pre-development condition for the 2-, 10- and 25-year peak storm events.

Modeling assumptions: The "Hydro-Cad" computer program was used to determine the peak storm water runoff for the pre- and post-development conditions. Hydro-Cad is a storm water modeling system, which utilizes the TR-20 method developed by the Soil Conservation Service (SCS).

The design assumptions used for this project are:

Design storm: 24 hour, Type III rainfall distribution.

Rainfall: 24-hour precipitation values from U.S. Weather Bureau Technical Release No. 40:

2-year storm = 3.0 inches
10-year storm = 4.4 inches
25-year storm = 5.1 inches

Site specific parameters for the project are listed below:

Soils: Soils information to determine the hydrologic soil group for the site is derived from the Soil Survey of Kennebec County by the United States Department of Agriculture Soil Conservation Service. The soils and hydrologic group are listed below:

Soil Classification	Hydrologic Group
Limerick (Lk)	"C"
Paxton-Charlton (PeC)	"C"
Windsor (WmC)	"A"
Winooski (WN)	"B"

Ground Cover:

Pre-Development: The existing watershed ground cover is modeled as impervious, lawn, meadow and woods.

Post-Development: The proposed watershed ground cover is impervious, lawn, meadow and woods.

Cover Description	Curve Number:
Impervious	98
Lawn "A"	39
Lawn "B"	61
Lawn "C"	74
Woods "A"	30
Woods "B"	55
Woods "C"	70
One-acre lots	68

Results:

The project will result in an increase of 94,935 sf of impervious area. These results are shown on the Hydro Cad output sheets enclosed at the end of the report. There are two distinct points to where stormwater runoff flows; an existing pond (SP2) on site and a 30" diameter cast iron pipe (SP1) that flows under the railroad tracks to the west. The stormwater from SP1 then flows to the south parallel to the railroad tracks approximately 770' to a 42" diameter CMP. The 42" diameter CMP extends to a catch basin on Cives Steel site before exiting to the Kennebec River.

There are additional flows that enter the site through an 18" diameter corrugated metal pipe under Lipman Road. This area labeled as Sub Area #6 contains 16.6 acres of land consisting of residential house lots, woods and impervious areas from roads. The flow from this pipe ends up in the pond located on the north side of the site for both the pre- and post-development.

Pre-development:

The hydrologic study evaluates a portion of the parcel that includes: impervious (31,395 sf), lawn (15,245 sf) and woods (171,440 sf) and is broken down into three drainage areas (see plan entitled "PRE"). The peak flows for the 2-, 10- and 25-year events (see node labeled "SP1") in the pre-development condition are 0.10 cfs (cubic feet per second), 1.23 cfs and 2.25 cfs. The peak flows for the 2-, 10- and 25-year events (see node labeled "SP2") in the pre-development condition are 3.19 cfs, 12.78 cfs and 18.89 cfs, respectively.

Post Development:

The proposed site (see plan entitled "C-1") will be comprised of impervious area (126,330 sf) and lawn (91,750 sf). The post-development is broken down into seven drainage areas and is shown on the plan entitled "POST". Summary tables showing the input values and resulting peak flows for subcatchments and reaches are also included at the end of the report. In the post development condition, the 2-, 10- and 25-year events for "SP1" yield 5.01 cfs, 9.48 cfs and 11.84 cfs. The peak flows for the 2-, 10- and 25-year events for "SP2" in the post-development condition are 3.70 cfs, 13.80 cfs and 20.11 cfs, respectively. See tables below for results.

PRE- & POST-DEVELOPMENT HYDROLOGIC RESULTS (SP1)

Event	Pre-Develop.	Post-Develop.	Difference
2 year	0.10 cfs	5.01 cfs	+ 4.91 cfs
10 year	1.23 cfs	9.48 cfs	+ 8.25 cfs
25 year	2.25 cfs	11.84 cfs	+ 9.59 cfs

PRE- & POST-DEVELOPMENT HYDROLOGIC RESULTS (SP2)

Event	Pre-Develop.	Post-Develop.	Difference
2 year	3.19 cfs	3.70 cfs	+ 0.51 cfs
10 year	12.78 cfs	13.80 cfs	+ 1.02 cfs
25 year	18.89 cfs	20.11 cfs	+ 1.22 cfs

Conclusion:

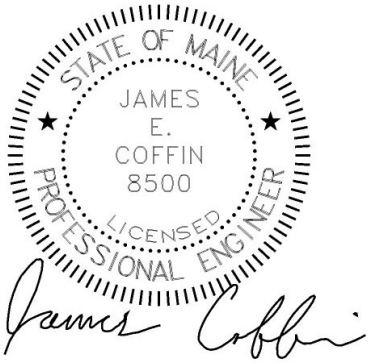
By comparing the node labeled "SP1", which is essentially the 30" diameter cast iron (CI) pipe in the post-development condition and in the pre-development condition, the results show that there will be an increase in flow for the three peak storm events. This is to be expected with the existing primarily wooded parcel being developed. There are also minor increases in flow for the three peak storm events flowing to SP2 (on-site pond).

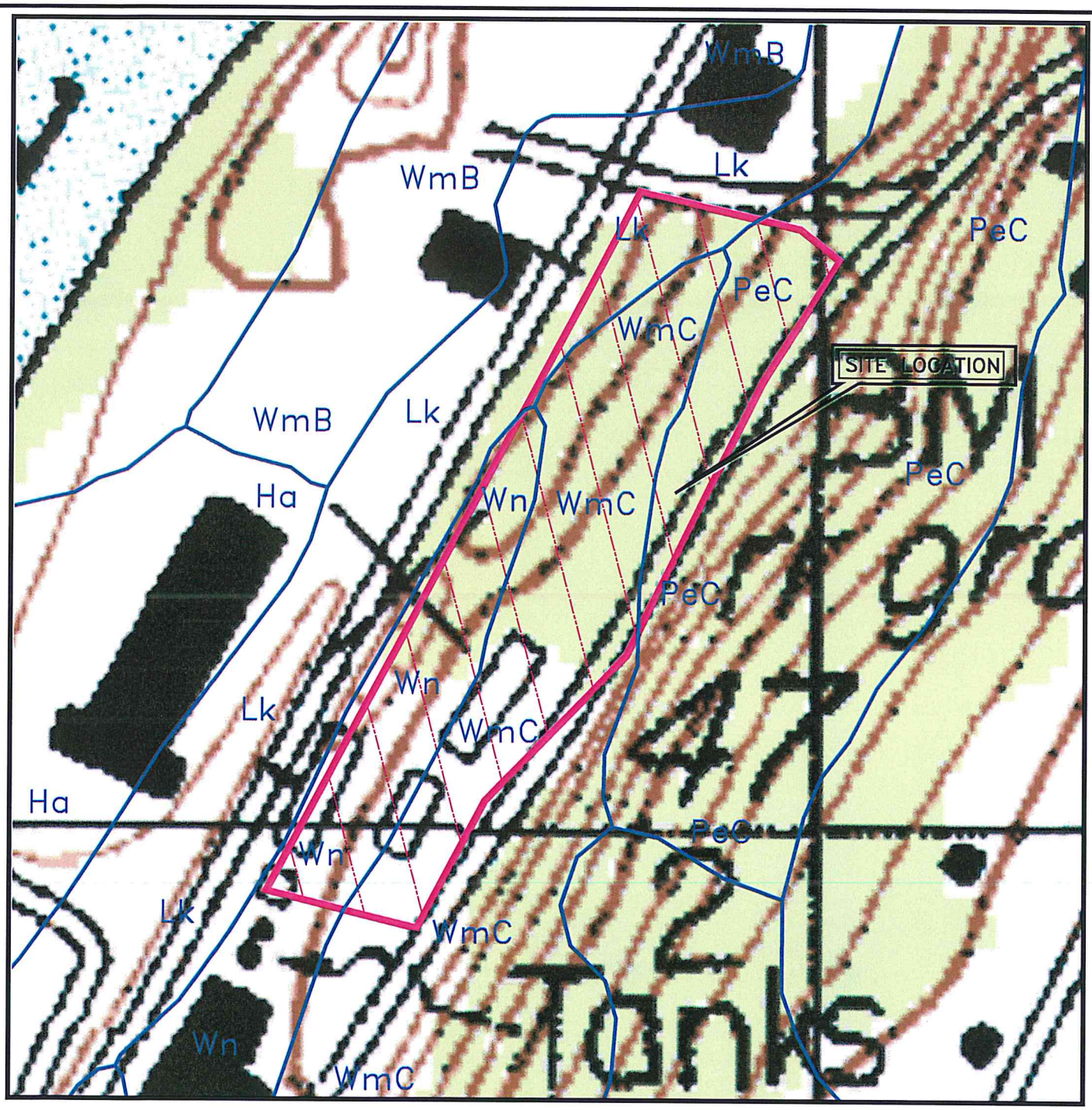
Normally the method to treat stormwater would be to install a detention pond to detain runoff from leaving the site. The drainage system would accommodate flows for the 2-, 10- and 25-year 24-hour peak storm events. This methodology would be counterproductive due to the positioning of the project within the watershed. Detaining runoff from the project will allow upstream flows to merge together and enter the stormwater system at approximately the same time causing greater volumes of runoff and thus creating more erosion downstream. The proper approach is to direct the runoff from the project immediately towards the Kennebec River before the remainder of the watershed goes through. This will cause the peak storm events within the watershed to not line up causing flooding downstream of the project.

We are asking for a variance in regard to stormwater runoff for this project due to its proximity to the Kennebec River as well as the 30" diameter CI pipe having a capacity of over 55 cfs. The maximum flow through this pipe is 11.84 cfs, which is less than 22% of the capacity of the 30" CI pipe for the 25-year event. If you should have any questions or concerns, please do not hesitate to contact me at 623-9475.

Respectfully submitted,

James E. Coffin, PE





SOILS FOUND ON-SITE

CLASSIFICATION	NAME / DESCRIPTION
Lk (C)	LIMERICK SILT LOAM
PeC (B/C)	PAXTON-CHARLTON VERY STONY FINE SANDY LOAMS, 8% TO 15% SLOPES
WmC (A)	WINDSOR LOAMY SAND, 8% TO 15% SLOPES
WN (B)	WINOOSKI SILT LOAM

INFORMATION REFERENCED FROM U.S. DEPT. OF AGRICULTURE S.C.S.
"SOIL SURVEY OF KENNEBEC COUNTY OF MAINE" MAP 46.

SOILS MAP

SCALE: 1"=200'

CLIENT/PROJECT:
BADJ PROPERTIES, LLC.

LOCATION: **LIPMAN ROAD**

TOWN: AUGUSTA COUNTY: KENNEBEC STATE: MAINE

ENGINEERING
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SHEET TITLE: **SOILS MAP**

SCALE: 1" = 200'

DATE: JANUARY 9, 2015

PROJ. NO. 2014-281

SOILS

GENERAL SITE INFORMATION:

1. OWNER: BADJ PROPERTIES, LLC.
   P.O. BOX 424
   HALLOWELL, ME 04347
2. AUGUSTA TAX MAP 53 LOT 22
3. KENNEBEC COUNTY REGISTRY OF DEEDS:
   BOOK 11864 PAGE 24
4. ZONE: INDUSTRIAL DISTRICT (IA)
5. IMPERVIOUS AREA:
   EXISTING IMPERVIOUS=29,550 SF
   NEW IMPERVIOUS= 120,905 SF
   NET NEW IMPERVIOUS= 91,355 SF
6. DISTURBED AREA: 168,390 SF
7. PARKING:
   REQ'D: 3 PER 1,000 SF OF BUILDING = 3 SPACES
   ACTUAL: 5 SPACES
8. WETLAND IMPACTS: 0 SF

STATE OF MAINE
JAMES E. COFFIN
8500
LICENSED PROFESSIONAL ENGINEER

E.S. COFFIN ENGINEERING & SURVEYING, INC.
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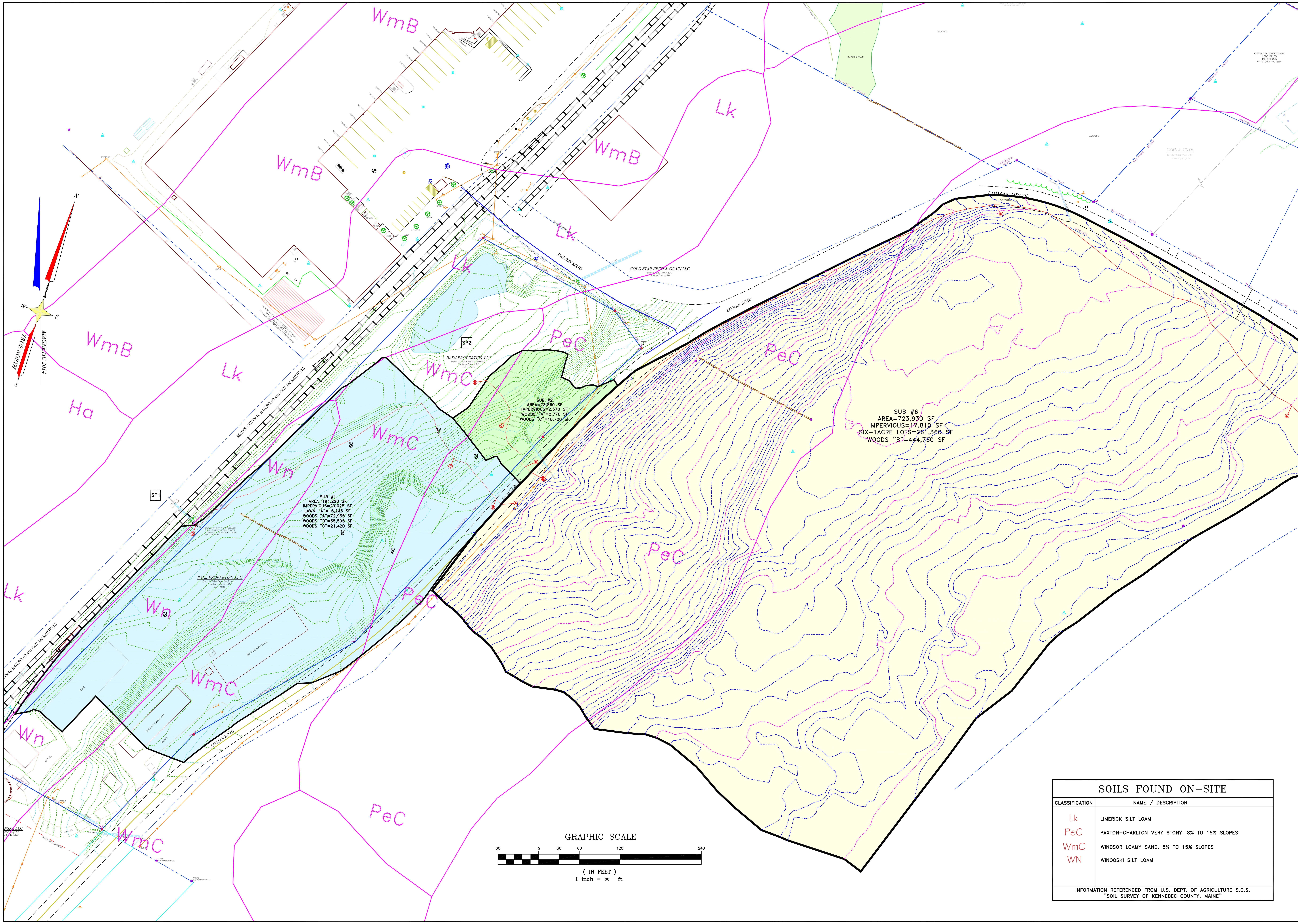
NO.	REVISIONS	DATE
1	REROUTE 18" DIAMETER PE PIPE TOWARDS POND	01/16/15

SHEET TITLE: PROPOSED SITE PLAN
SCALE: 1 INCH=40 FEET
DATE: JANUARY 9, 2015
DRAWN BY: TGH
CHECKED BY: JEC

CLIENT/PROJECT: BADJ PROPERTIES, LLC.
JOHN CLARK
LOCATION: 79 LIPMAN ROAD
TOWN: AUGUSTA
COUNTY: KENNEBEC
STATE: MAINE

PROJ. NO. 2014-281

C-1



SOILS FOUND ON-SITE

CLASSIFICATION	NAME / DESCRIPTION
Lk	LIMERICK SILT LOAM
PeC	PAXTON-CHARLTON VERY STONY, 8% TO 15% SLOPES
WmC	WINDSOR LOAMY SAND, 8% TO 15% SLOPES
WN	WINOOSKI SILT LOAM

INFORMATION REFERENCED FROM U.S. DEPT. OF AGRICULTURE S.C.S. "SOIL SURVEY OF KENNEBEC COUNTY, MAINE"

STATE OF MAINE
JAMES E. COFFIN
8500
LICENSED PROFESSIONAL ENGINEER

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NO.	REVISIONS	DATE

SHEET TITLE: **PRE-DEVELOPMENT PLAN**

SCALE: 1 INCH=60 FEET

DATE: JANUARY 09, 2015

DRAWN BY: KPC

CHECKED BY: MJG

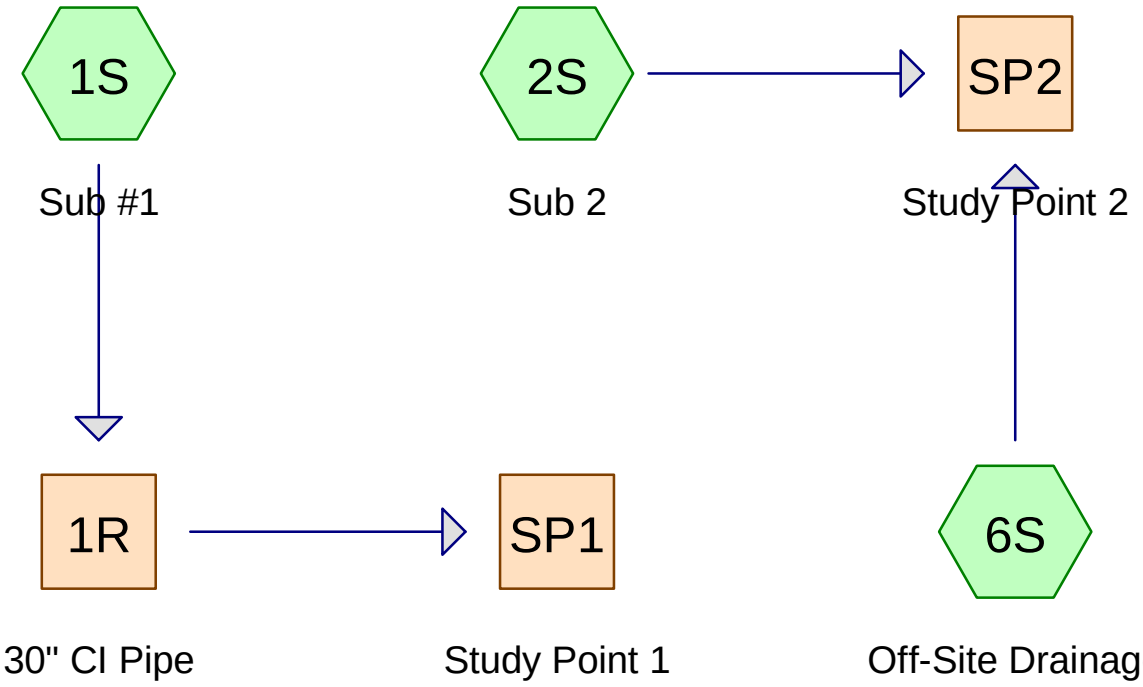
CLIENT/PROJECT: **STAGING AREA BADJ PROPERTIES, LLC**

LOCATION: 79 LIPMAN ROAD

TOWN: AUGUSTA COUNTY: KENNEBEC STATE: MAINE

PROJ. NO. 2014-281

PRE



Subcat Reach Pond Link

Routing Diagram for BADJ PROPERTIES PRE-DEV.
Prepared by Microsoft, Printed 1/16/2015

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Sub #1 Runoff Area=194,220 sf 14.94% Impervious Runoff Depth>0.10"
Flow Length=580' Tc=18.1 min CN=52 Runoff=0.10 cfs 0.037 af

Subcatchment 2S: Sub 2 Runoff Area=23,860 sf 9.93% Impervious Runoff Depth>0.56"
Flow Length=165' Tc=10.3 min CN=68 Runoff=0.28 cfs 0.025 af

Subcatchment 6S: Off-Site Drainage Runoff Area=723,930 sf 7.22% Impervious Runoff Depth>0.31"
Flow Length=1,426' Tc=17.1 min CN=61 Runoff=3.00 cfs 0.435 af

Reach 1R: 30" CI Pipe Avg. Flow Depth=0.08' Max Vel=2.14 fps Inflow=0.10 cfs 0.037 af
30.0" Round Pipe n=0.013 L=38.0' S=0.0184 '/' Capacity=55.67 cfs Outflow=0.10 cfs 0.037 af

Reach SP1: Study Point 1 Inflow=0.10 cfs 0.037 af
Outflow=0.10 cfs 0.037 af

Reach SP2: Study Point 2 Inflow=3.19 cfs 0.461 af
Outflow=3.19 cfs 0.461 af

Total Runoff Area = 21.626 ac Runoff Volume = 0.498 af Average Runoff Depth = 0.28"
91.12% Pervious = 19.705 ac 8.88% Impervious = 1.921 ac

Summary for Subcatchment 1S: Sub #1

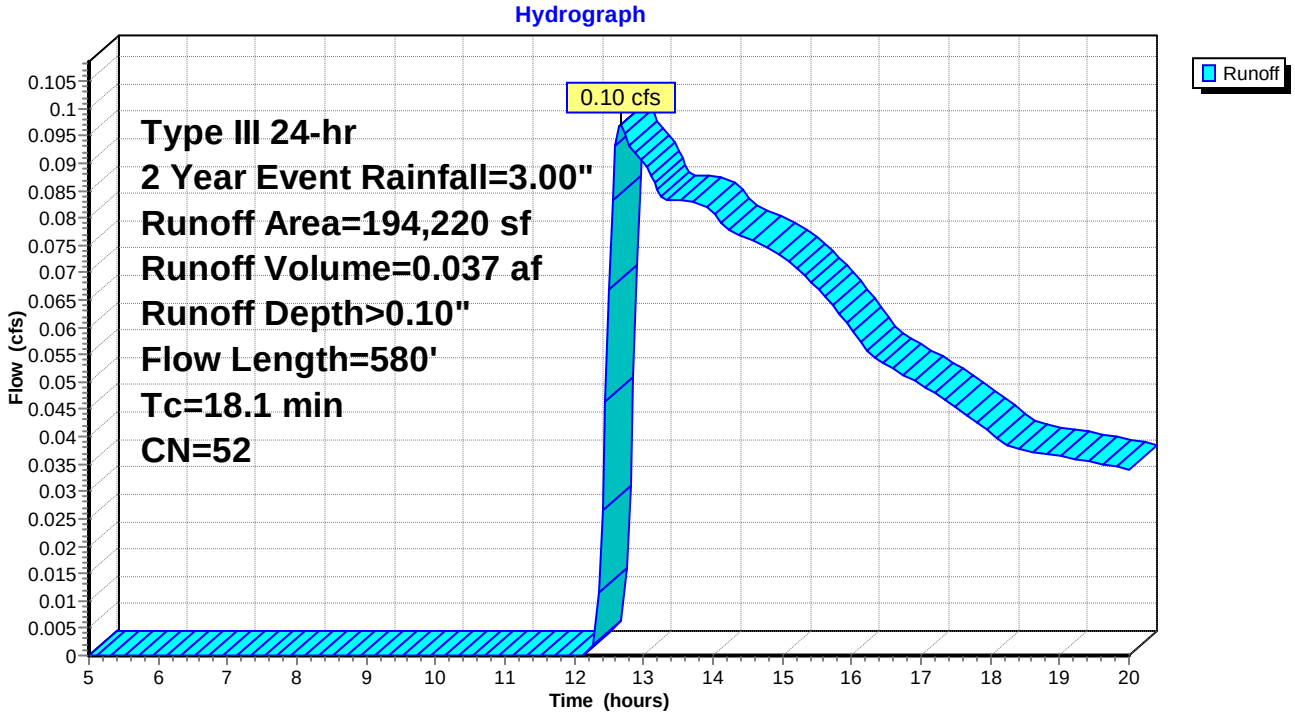
Runoff = 0.10 cfs @ 12.67 hrs, Volume= 0.037 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Event Rainfall=3.00"

Area (sf)	CN	Description
29,025	98	Water Surface, HSG C
15,245	39	>75% Grass cover, Good, HSG A
72,935	30	Woods, Good, HSG A
55,595	55	Woods, Good, HSG B
21,420	70	Woods, Good, HSG C
194,220	52	Weighted Average
165,195		85.06% Pervious Area
29,025		14.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0200	0.86		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
9.9	89	0.1200	0.15		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.00"
8.0	480	0.0396	0.99		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
18.1	580	Total			

Subcatchment 1S: Sub #1



Summary for Subcatchment 2S: Sub 2

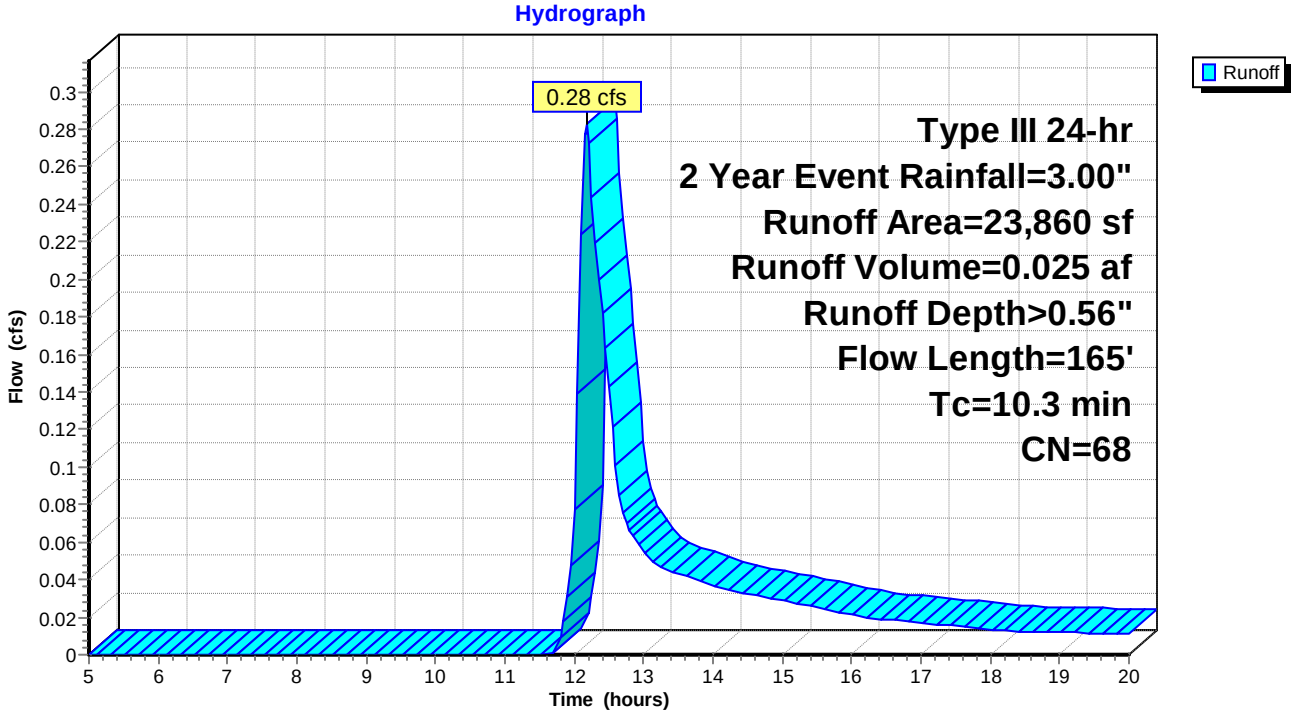
Runoff = 0.28 cfs @ 12.17 hrs, Volume= 0.025 af, Depth> 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Event Rainfall=3.00"

Area (sf)	CN	Description
2,370	98	Water Surface, HSG C
2,770	30	Woods, Good, HSG A
18,720	70	Woods, Good, HSG C
23,860	68	Weighted Average
21,490		90.07% Pervious Area
2,370		9.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0200	0.86		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
9.6	89	0.1300	0.16		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.00"
0.5	65	0.1615	2.01		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
10.3	165	Total			

Subcatchment 2S: Sub 2



Summary for Subcatchment 6S: Off-Site Drainage

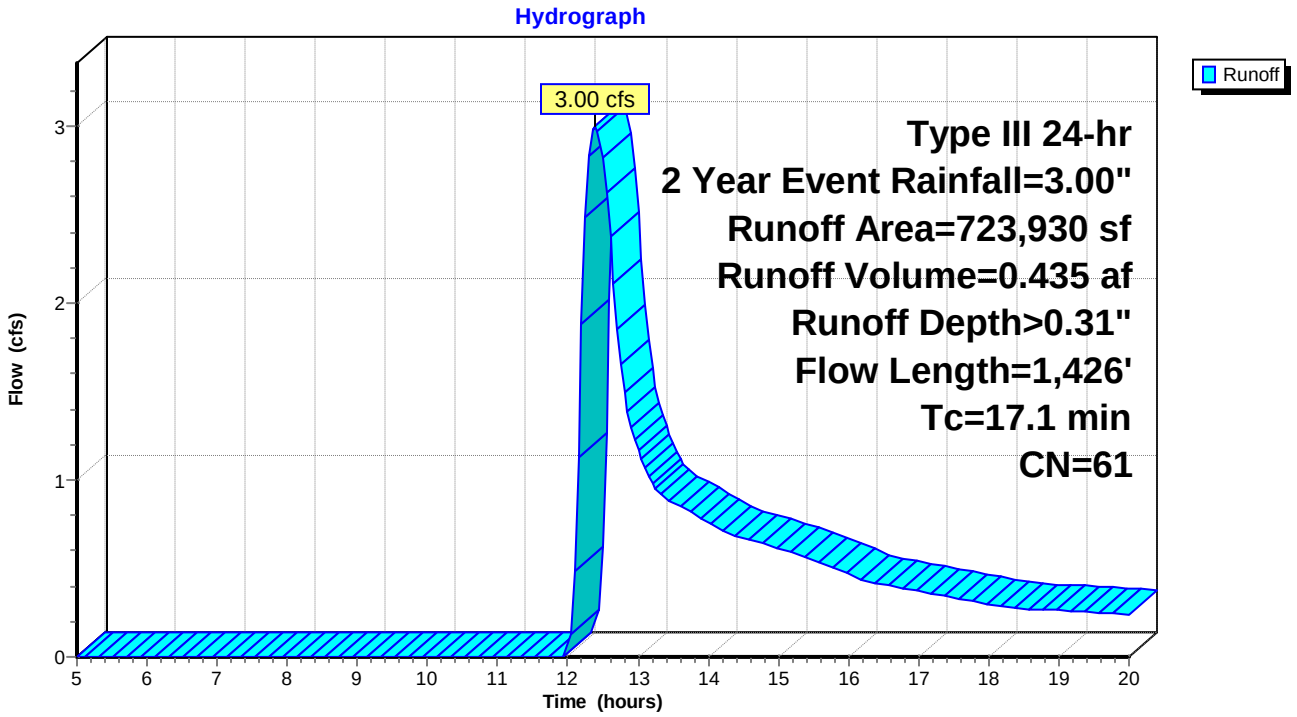
Runoff = 3.00 cfs @ 12.39 hrs, Volume= 0.435 af, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Event Rainfall=3.00"

Area (sf)	CN	Description
17,810	98	Water Surface, 0% imp, HSG C
261,360	68	1 acre lots, 20% imp, HSG B
444,760	55	Woods, Good, HSG B
723,930	61	Weighted Average
671,658		92.78% Pervious Area
52,272		7.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0200	0.76		**Sheet Flow, AB**
					Smooth surfaces n= 0.011 P2= 3.00"
9.4	94	0.0213	0.17		**Sheet Flow, BC**
					Grass: Short n= 0.150 P2= 3.00"
6.3	550	0.0836	1.45		**Shallow Concentrated Flow, CD**
					Woodland Kv= 5.0 fps
1.3	776	0.0657	9.69	58.13	**Channel Flow, DE**
					Area= 6.0 sf Perim= 9.0' r= 0.67'
					n= 0.030 Earth, clean & winding
17.1	1,426	Total			

Subcatchment 6S: Off-Site Drainage



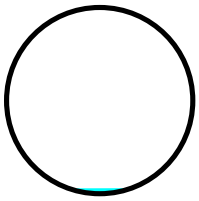
Summary for Reach 1R: 30" CI Pipe

Inflow Area = 4.459 ac, 14.94% Impervious, Inflow Depth > 0.10" for 2 Year Event event
Inflow = 0.10 cfs @ 12.67 hrs, Volume= 0.037 af
Outflow = 0.10 cfs @ 12.69 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.9 min

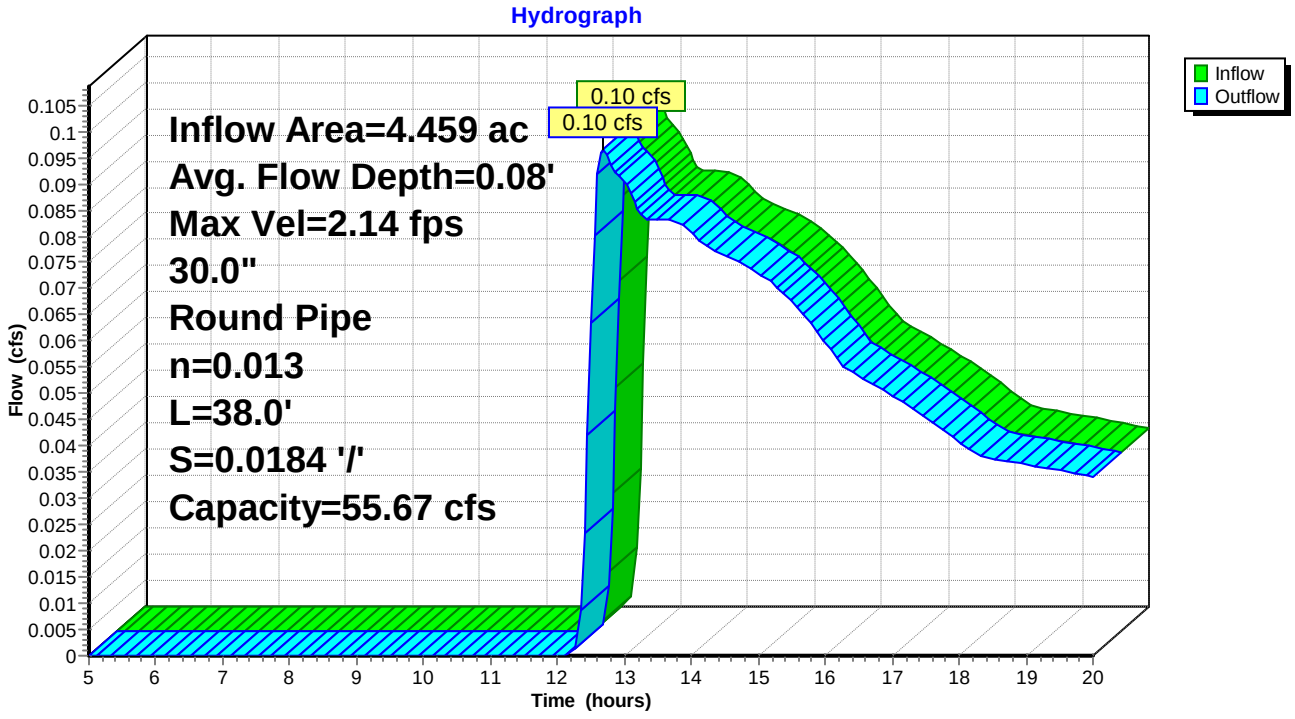
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.14 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.82 fps, Avg. Travel Time= 0.3 min

Peak Storage= 2 cf @ 12.68 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 55.67 cfs

30.0" Round Pipe
n= 0.013 Cast iron, coated
Length= 38.0' Slope= 0.0184 '/'
Inlet Invert= 89.00', Outlet Invert= 88.30'



Reach 1R: 30" CI Pipe

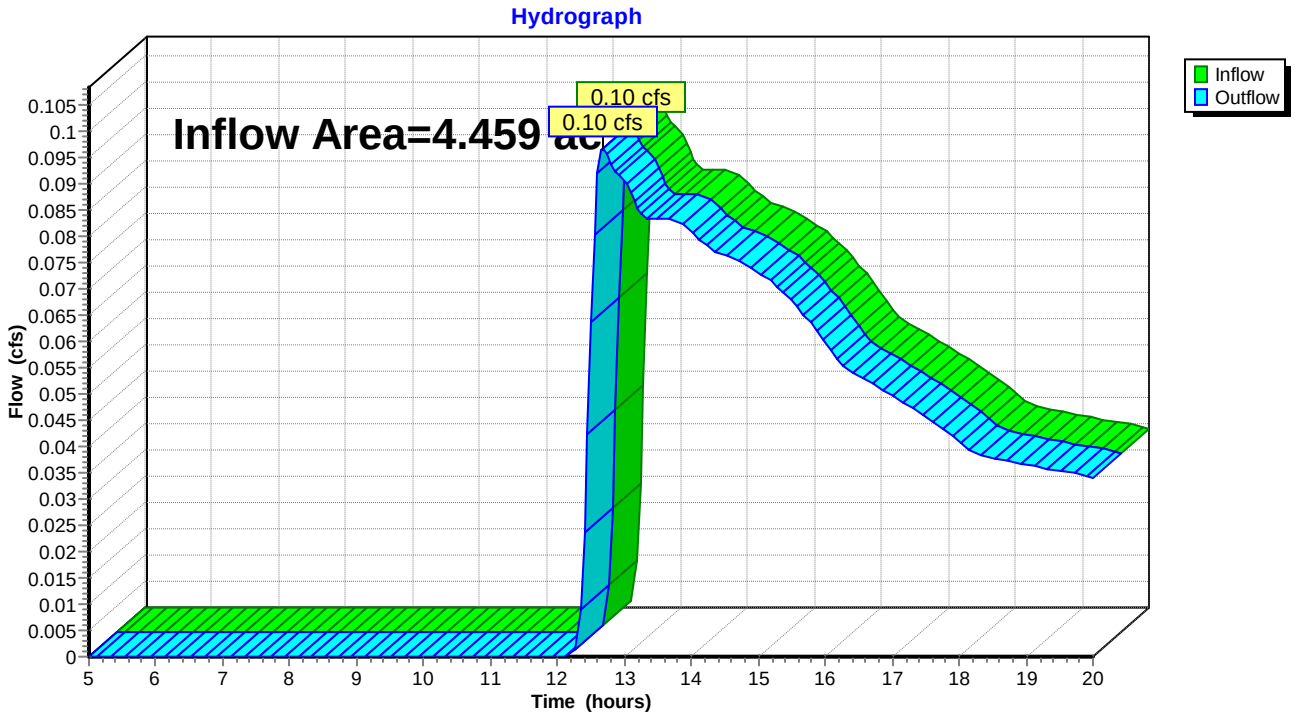


Summary for Reach SP1: Study Point 1

Inflow Area = 4.459 ac, 14.94% Impervious, Inflow Depth > 0.10" for 2 Year Event event
Inflow = 0.10 cfs @ 12.69 hrs, Volume= 0.037 af
Outflow = 0.10 cfs @ 12.69 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP1: Study Point 1

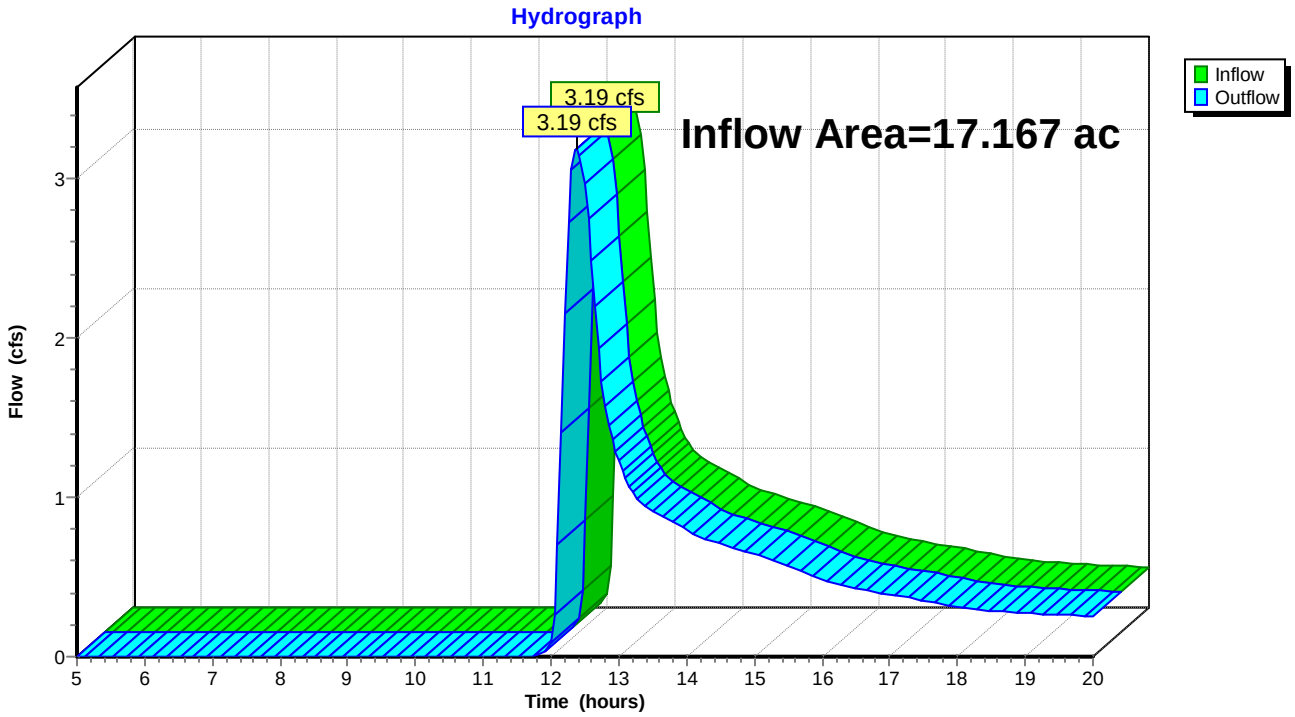


Summary for Reach SP2: Study Point 2

Inflow Area = 17.167 ac, 7.31% Impervious, Inflow Depth > 0.32" for 2 Year Event event
Inflow = 3.19 cfs @ 12.38 hrs, Volume= 0.461 af
Outflow = 3.19 cfs @ 12.38 hrs, Volume= 0.461 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP2: Study Point 2



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Sub #1 Runoff Area=194,220 sf 14.94% Impervious Runoff Depth>0.48"
Flow Length=580' Tc=18.1 min CN=52 Runoff=1.23 cfs 0.177 af

Subcatchment 2S: Sub 2 Runoff Area=23,860 sf 9.93% Impervious Runoff Depth>1.34"
Flow Length=165' Tc=10.3 min CN=68 Runoff=0.77 cfs 0.061 af

Subcatchment 6S: Off-Site Drainage Runoff Area=723,930 sf 7.22% Impervious Runoff Depth>0.91"
Flow Length=1,426' Tc=17.1 min CN=61 Runoff=12.21 cfs 1.267 af

Reach 1R: 30" CI Pipe Avg. Flow Depth=0.26' Max Vel=4.63 fps Inflow=1.23 cfs 0.177 af
30.0" Round Pipe n=0.013 L=38.0' S=0.0184 '/' Capacity=55.67 cfs Outflow=1.23 cfs 0.177 af

Reach SP1: Study Point 1 Inflow=1.23 cfs 0.177 af
Outflow=1.23 cfs 0.177 af

Reach SP2: Study Point 2 Inflow=12.78 cfs 1.328 af
Outflow=12.78 cfs 1.328 af

Total Runoff Area = 21.626 ac Runoff Volume = 1.505 af Average Runoff Depth = 0.83"
91.12% Pervious = 19.705 ac 8.88% Impervious = 1.921 ac

Summary for Subcatchment 1S: Sub #1

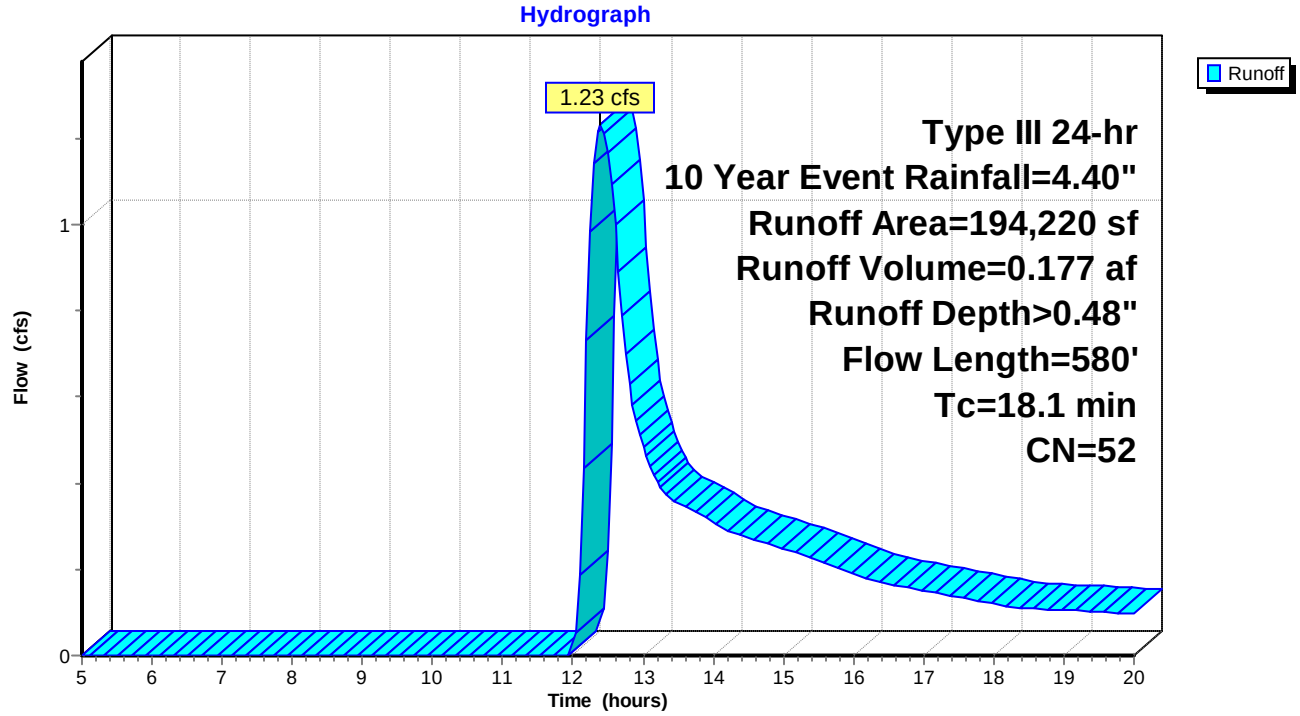
Runoff = 1.23 cfs @ 12.40 hrs, Volume= 0.177 af, Depth> 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Event Rainfall=4.40"

Area (sf)	CN	Description
29,025	98	Water Surface, HSG C
15,245	39	>75% Grass cover, Good, HSG A
72,935	30	Woods, Good, HSG A
55,595	55	Woods, Good, HSG B
21,420	70	Woods, Good, HSG C
194,220	52	Weighted Average
165,195		85.06% Pervious Area
29,025		14.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0200	0.86		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
9.9	89	0.1200	0.15		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.00"
8.0	480	0.0396	0.99		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
18.1	580	Total			

Subcatchment 1S: Sub #1



Summary for Subcatchment 2S: Sub 2

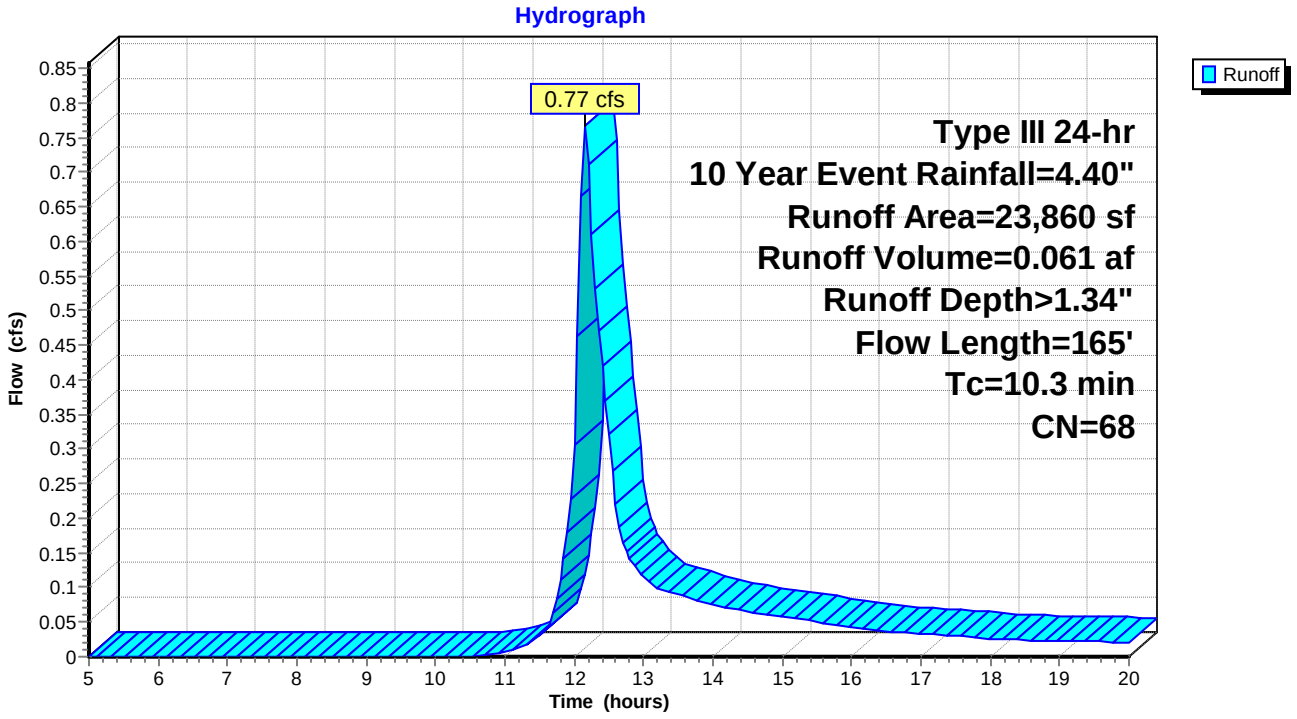
Runoff = 0.77 cfs @ 12.16 hrs, Volume= 0.061 af, Depth> 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Event Rainfall=4.40"

Area (sf)	CN	Description
2,370	98	Water Surface, HSG C
2,770	30	Woods, Good, HSG A
18,720	70	Woods, Good, HSG C
23,860	68	Weighted Average
21,490		90.07% Pervious Area
2,370		9.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0200	0.86		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
9.6	89	0.1300	0.16		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.00"
0.5	65	0.1615	2.01		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
10.3	165	Total			

Subcatchment 2S: Sub 2



Summary for Subcatchment 6S: Off-Site Drainage

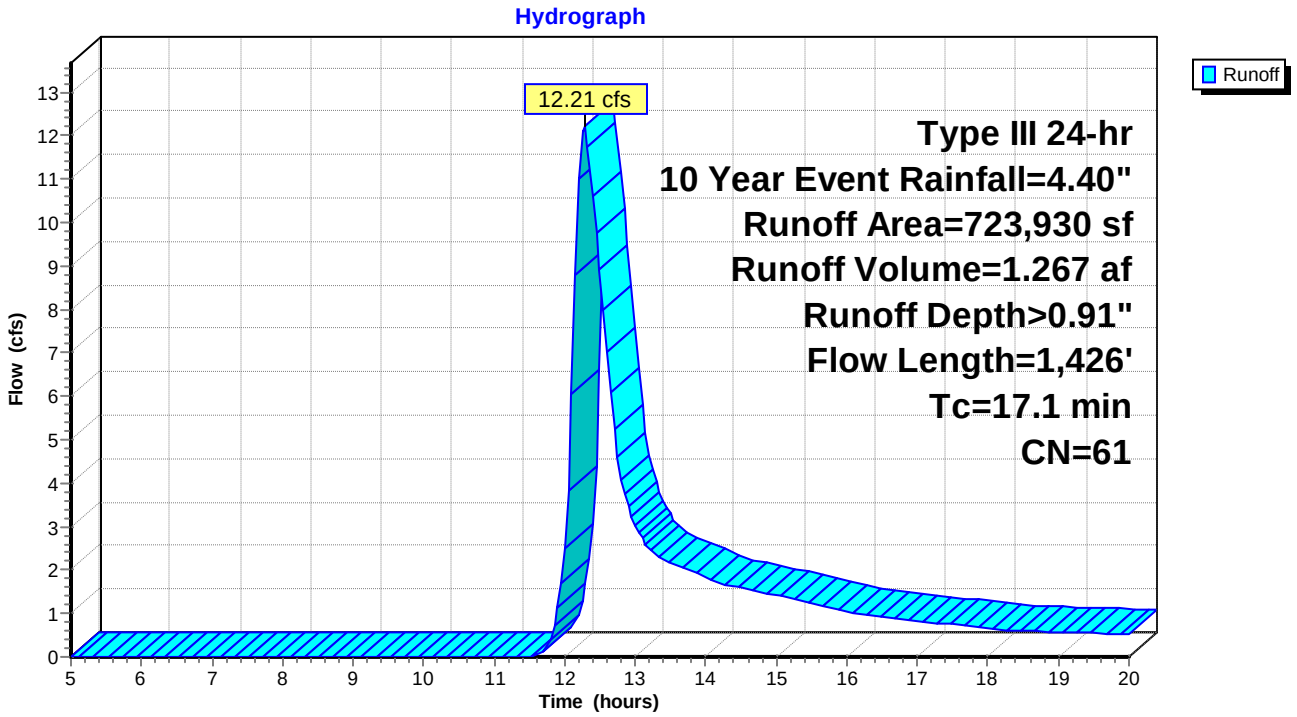
Runoff = 12.21 cfs @ 12.27 hrs, Volume= 1.267 af, Depth> 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Event Rainfall=4.40"

Area (sf)	CN	Description
17,810	98	Water Surface, 0% imp, HSG C
261,360	68	1 acre lots, 20% imp, HSG B
444,760	55	Woods, Good, HSG B
723,930	61	Weighted Average
671,658		92.78% Pervious Area
52,272		7.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0200	0.76		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
9.4	94	0.0213	0.17		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
6.3	550	0.0836	1.45		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
1.3	776	0.0657	9.69	58.13	**Channel Flow, DE** Area= 6.0 sf Perim= 9.0' r= 0.67' n= 0.030 Earth, clean & winding
17.1	1,426	Total			

Subcatchment 6S: Off-Site Drainage



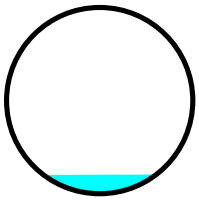
Summary for Reach 1R: 30" CI Pipe

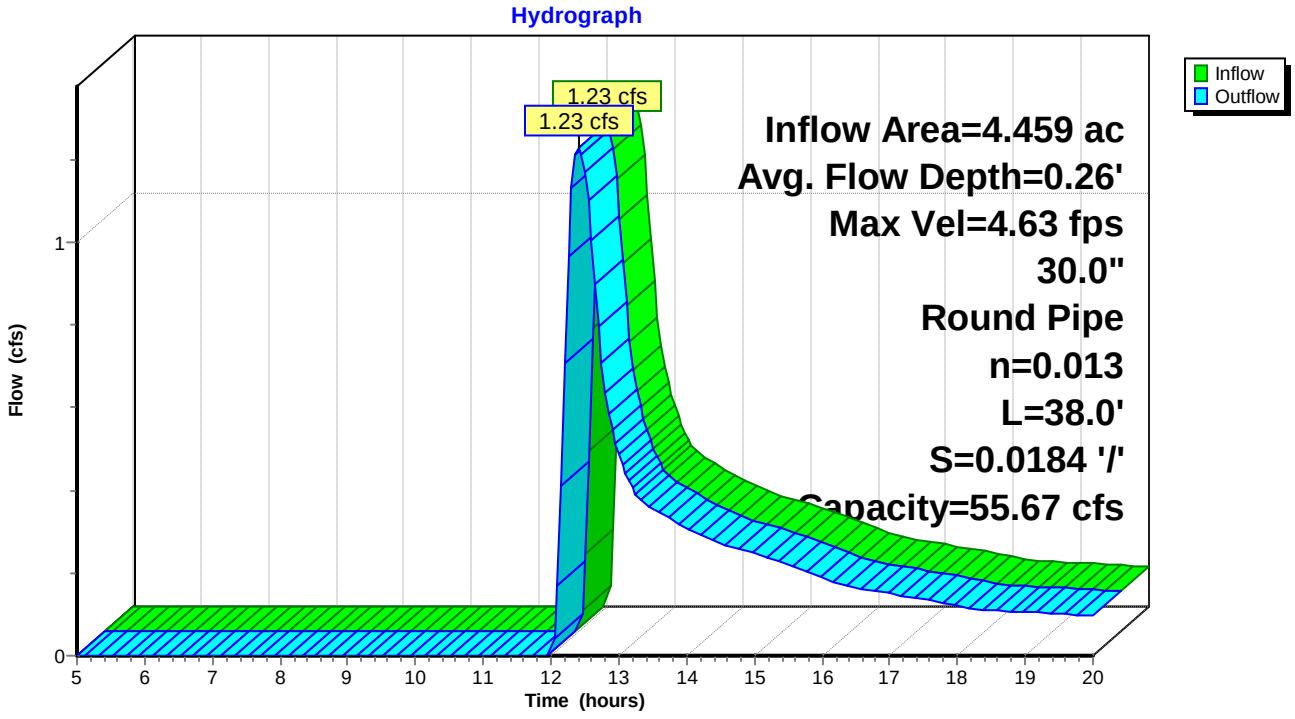
Inflow Area = 4.459 ac, 14.94% Impervious, Inflow Depth > 0.48" for 10 Year Event event
Inflow = 1.23 cfs @ 12.40 hrs, Volume= 0.177 af
Outflow = 1.23 cfs @ 12.40 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.63 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.74 fps, Avg. Travel Time= 0.2 min

Peak Storage= 10 cf @ 12.40 hrs
Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 55.67 cfs

30.0" Round Pipe
n= 0.013 Cast iron, coated
Length= 38.0' Slope= 0.0184 '/'
Inlet Invert= 89.00', Outlet Invert= 88.30'



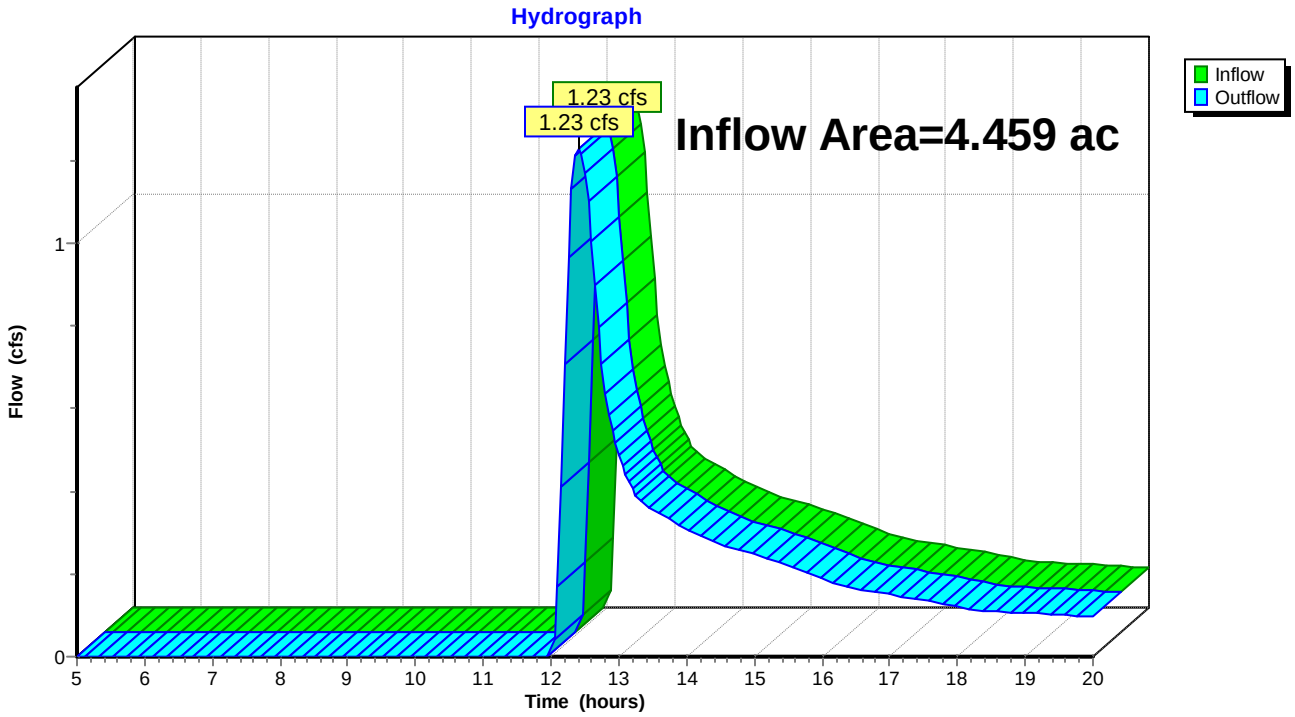


Summary for Reach SP1: Study Point 1

Inflow Area = 4.459 ac, 14.94% Impervious, Inflow Depth > 0.48" for 10 Year Event event
Inflow = 1.23 cfs @ 12.40 hrs, Volume= 0.177 af
Outflow = 1.23 cfs @ 12.40 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP1: Study Point 1

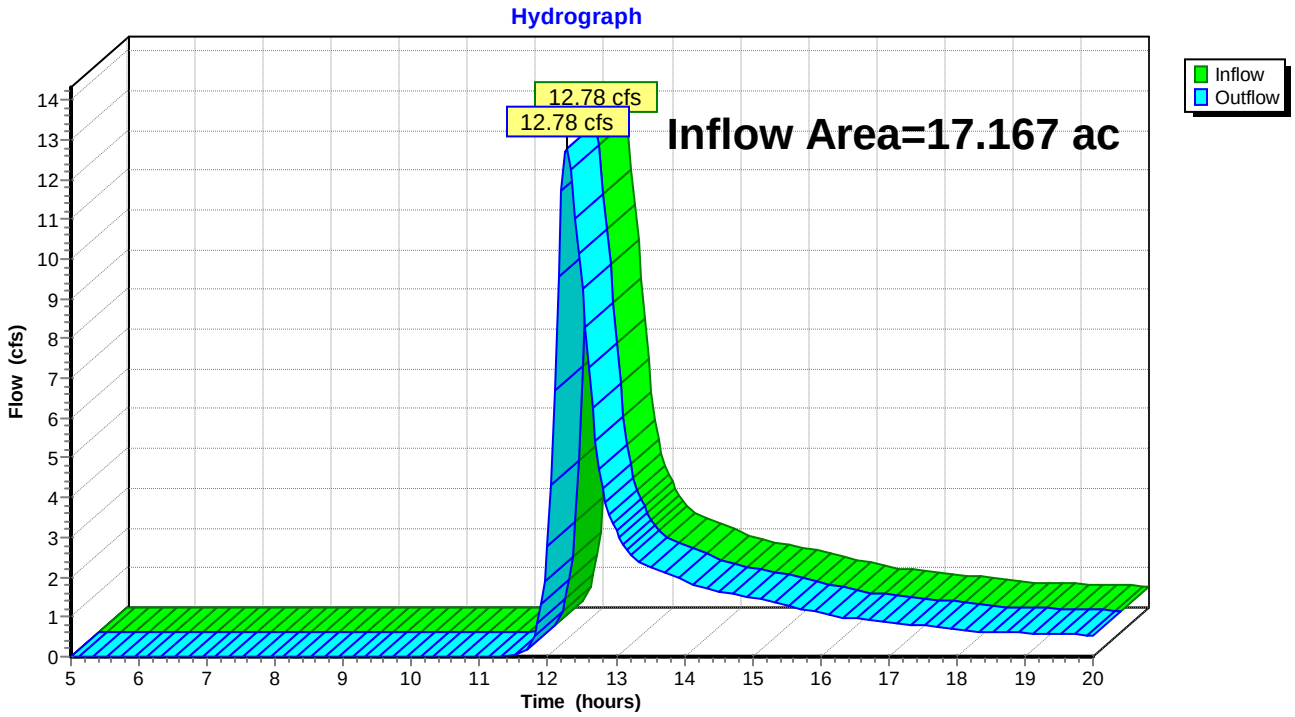


Summary for Reach SP2: Study Point 2

Inflow Area = 17.167 ac, 7.31% Impervious, Inflow Depth > 0.93" for 10 Year Event event
Inflow = 12.78 cfs @ 12.27 hrs, Volume= 1.328 af
Outflow = 12.78 cfs @ 12.27 hrs, Volume= 1.328 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP2: Study Point 2



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Sub #1 Runoff Area=194,220 sf 14.94% Impervious Runoff Depth>0.74"
Flow Length=580' Tc=18.1 min CN=52 Runoff=2.25 cfs 0.276 af

Subcatchment 2S: Sub 2 Runoff Area=23,860 sf 9.93% Impervious Runoff Depth>1.79"
Flow Length=165' Tc=10.3 min CN=68 Runoff=1.04 cfs 0.082 af

Subcatchment 6S: Off-Site Drainage Runoff Area=723,930 sf 7.22% Impervious Runoff Depth>1.29"
Flow Length=1,426' Tc=17.1 min CN=61 Runoff=18.10 cfs 1.784 af

Reach 1R: 30" CI Pipe Avg. Flow Depth=0.34' Max Vel=5.55 fps Inflow=2.25 cfs 0.276 af
30.0" Round Pipe n=0.013 L=38.0' S=0.0184 '/' Capacity=55.67 cfs Outflow=2.25 cfs 0.276 af

Reach SP1: Study Point 1 Inflow=2.25 cfs 0.276 af
Outflow=2.25 cfs 0.276 af

Reach SP2: Study Point 2 Inflow=18.89 cfs 1.866 af
Outflow=18.89 cfs 1.866 af

Total Runoff Area = 21.626 ac Runoff Volume = 2.142 af Average Runoff Depth = 1.19"
91.12% Pervious = 19.705 ac 8.88% Impervious = 1.921 ac

Summary for Subcatchment 1S: Sub #1

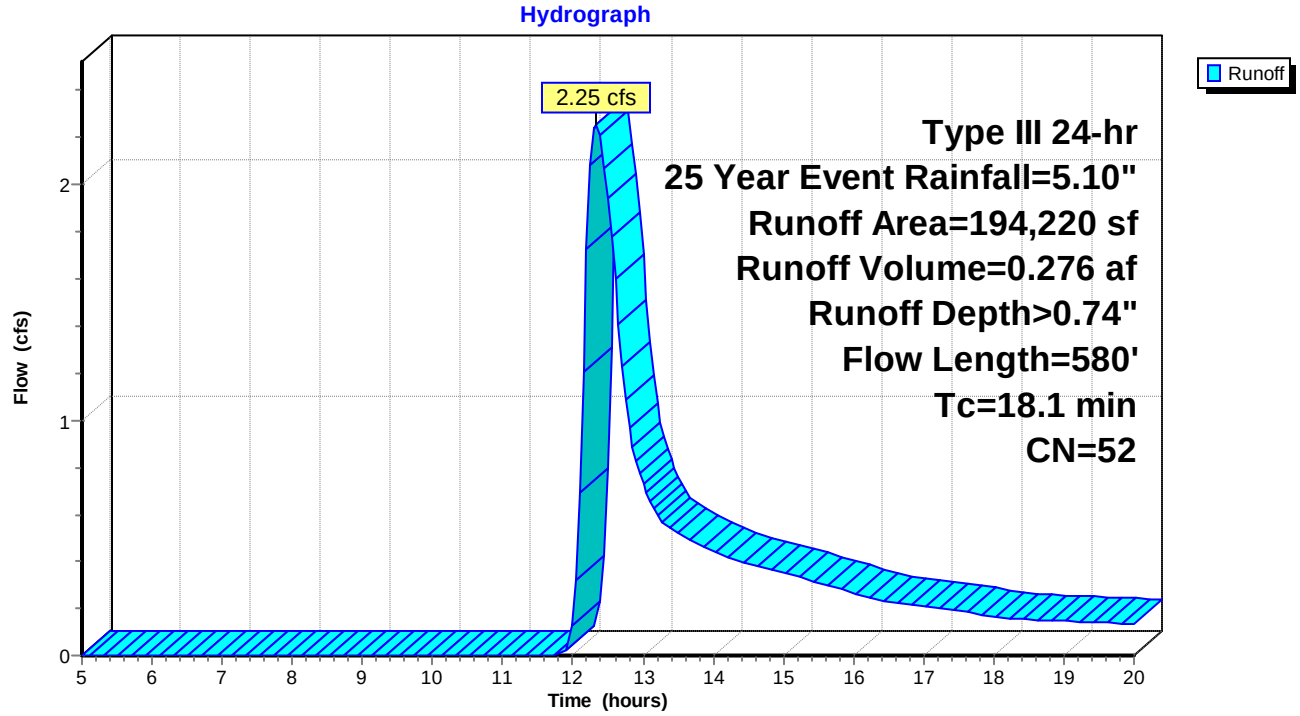
Runoff = 2.25 cfs @ 12.33 hrs, Volume= 0.276 af, Depth> 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Event Rainfall=5.10"

Area (sf)	CN	Description
29,025	98	Water Surface, HSG C
15,245	39	>75% Grass cover, Good, HSG A
72,935	30	Woods, Good, HSG A
55,595	55	Woods, Good, HSG B
21,420	70	Woods, Good, HSG C
194,220	52	Weighted Average
165,195		85.06% Pervious Area
29,025		14.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0200	0.86		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
9.9	89	0.1200	0.15		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.00"
8.0	480	0.0396	0.99		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
18.1	580	Total			

Subcatchment 1S: Sub #1



Summary for Subcatchment 2S: Sub 2

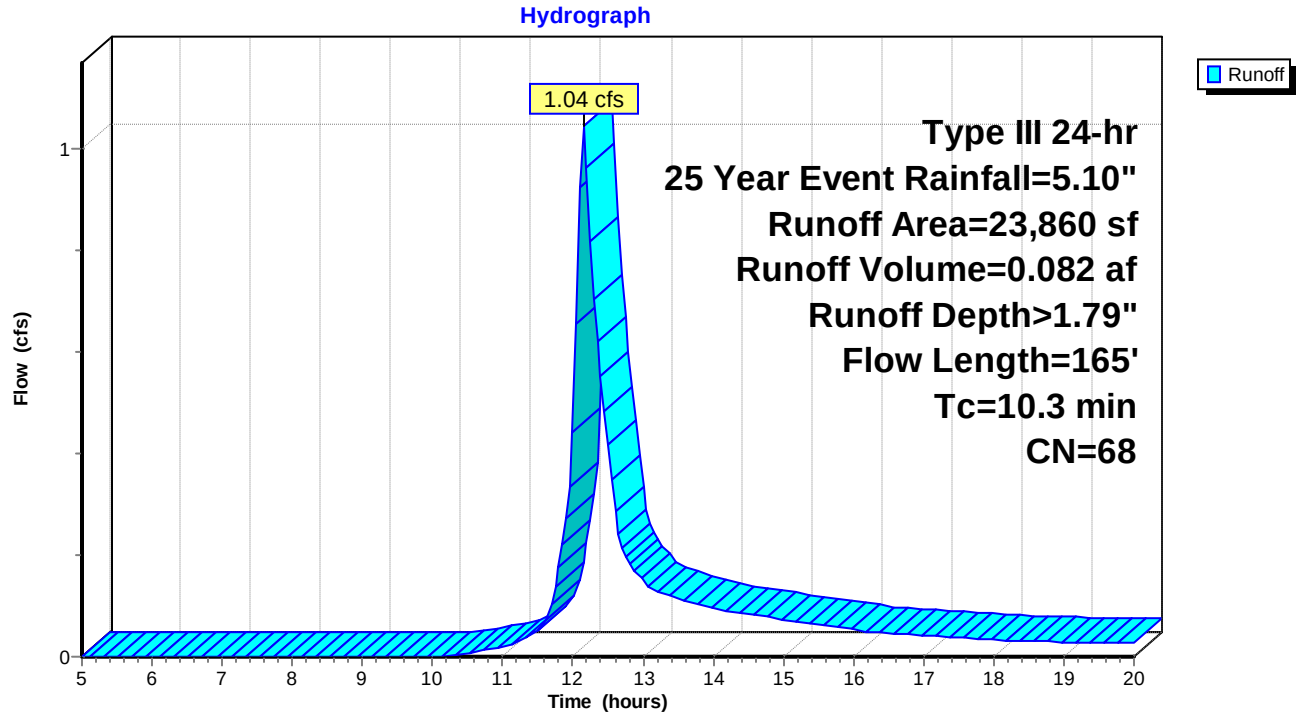
Runoff = 1.04 cfs @ 12.15 hrs, Volume= 0.082 af, Depth> 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Event Rainfall=5.10"

Area (sf)	CN	Description
2,370	98	Water Surface, HSG C
2,770	30	Woods, Good, HSG A
18,720	70	Woods, Good, HSG C
23,860	68	Weighted Average
21,490		90.07% Pervious Area
2,370		9.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	11	0.0200	0.86		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
9.6	89	0.1300	0.16		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 3.00"
0.5	65	0.1615	2.01		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
10.3	165	Total			

Subcatchment 2S: Sub 2



Summary for Subcatchment 6S: Off-Site Drainage

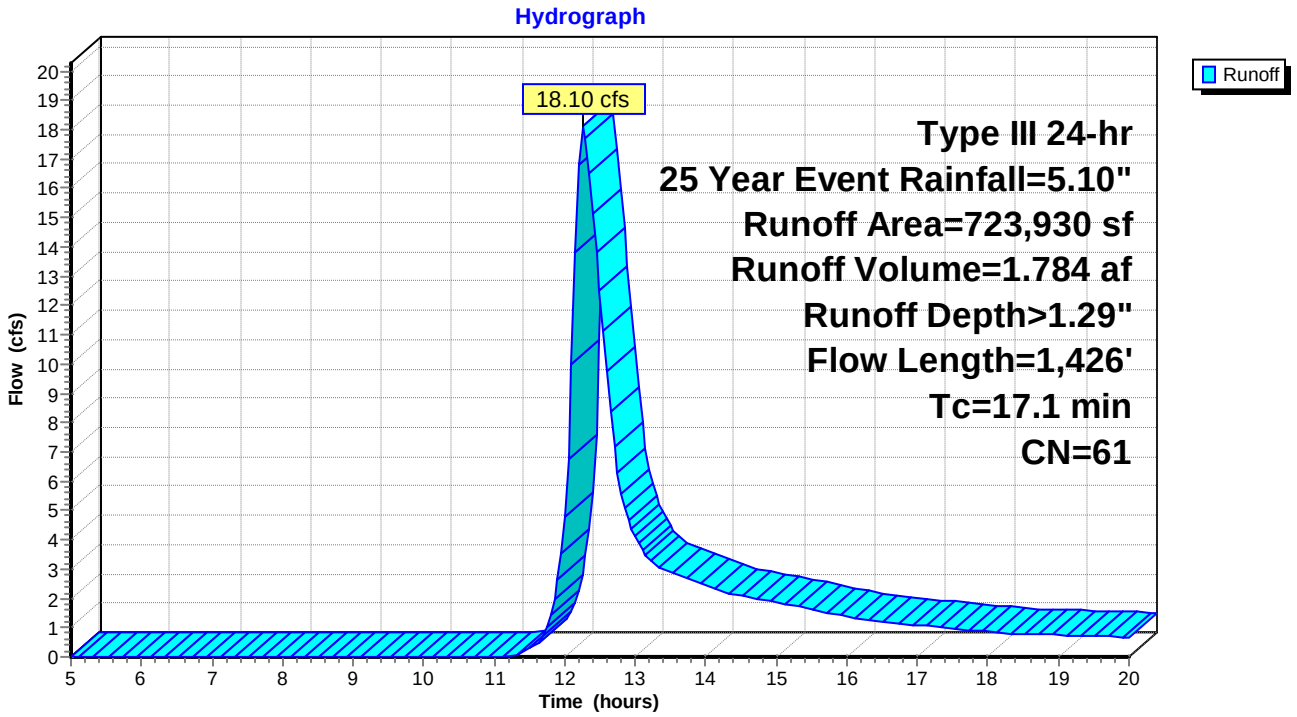
Runoff = 18.10 cfs @ 12.26 hrs, Volume= 1.784 af, Depth> 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Event Rainfall=5.10"

Area (sf)	CN	Description
17,810	98	Water Surface, 0% imp, HSG C
261,360	68	1 acre lots, 20% imp, HSG B
444,760	55	Woods, Good, HSG B
723,930	61	Weighted Average
671,658		92.78% Pervious Area
52,272		7.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0200	0.76		**Sheet Flow, AB**
					Smooth surfaces n= 0.011 P2= 3.00"
9.4	94	0.0213	0.17		**Sheet Flow, BC**
					Grass: Short n= 0.150 P2= 3.00"
6.3	550	0.0836	1.45		**Shallow Concentrated Flow, CD**
					Woodland Kv= 5.0 fps
1.3	776	0.0657	9.69	58.13	**Channel Flow, DE**
					Area= 6.0 sf Perim= 9.0' r= 0.67'
					n= 0.030 Earth, clean & winding
17.1	1,426	Total			

Subcatchment 6S: Off-Site Drainage



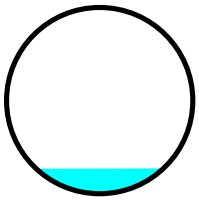
Summary for Reach 1R: 30" CI Pipe

Inflow Area = 4.459 ac, 14.94% Impervious, Inflow Depth > 0.74" for 25 Year Event event
Inflow = 2.25 cfs @ 12.33 hrs, Volume= 0.276 af
Outflow = 2.25 cfs @ 12.33 hrs, Volume= 0.276 af, Atten= 0%, Lag= 0.3 min

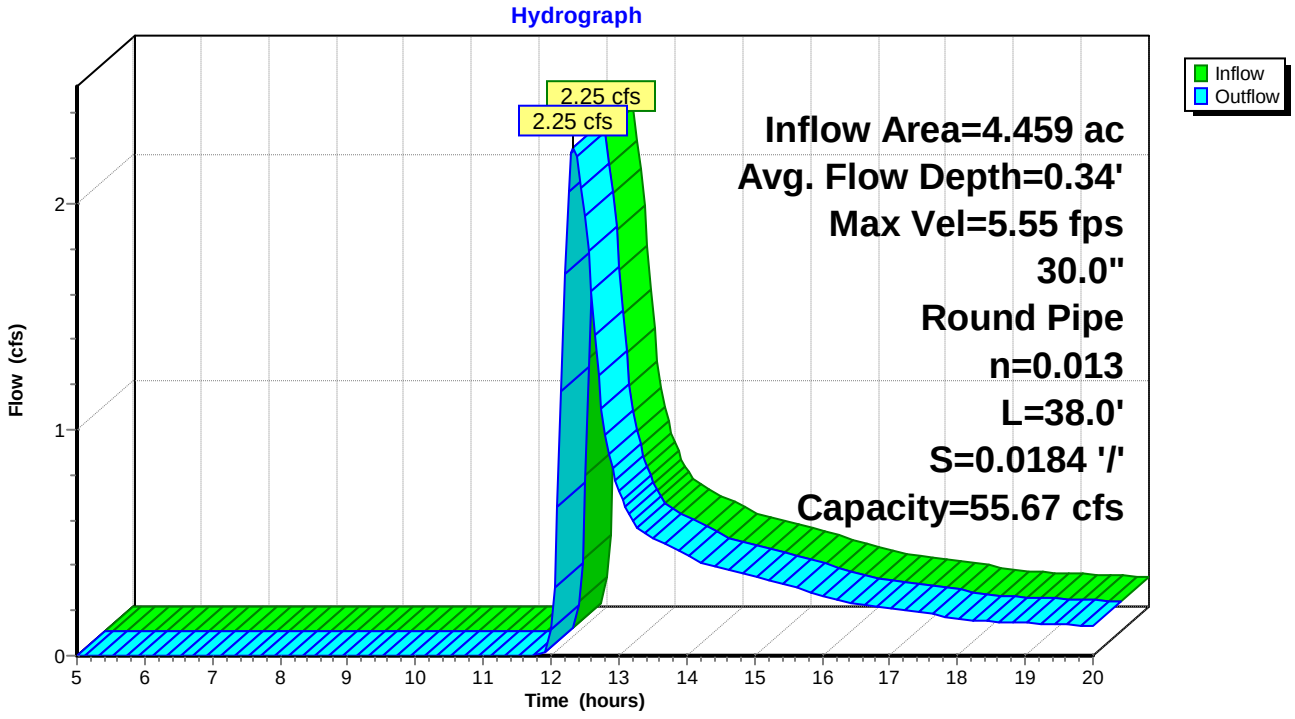
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.55 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.07 fps, Avg. Travel Time= 0.2 min

Peak Storage= 15 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 55.67 cfs

30.0" Round Pipe
n= 0.013 Cast iron, coated
Length= 38.0' Slope= 0.0184 '/'
Inlet Invert= 89.00', Outlet Invert= 88.30'



Reach 1R: 30" CI Pipe

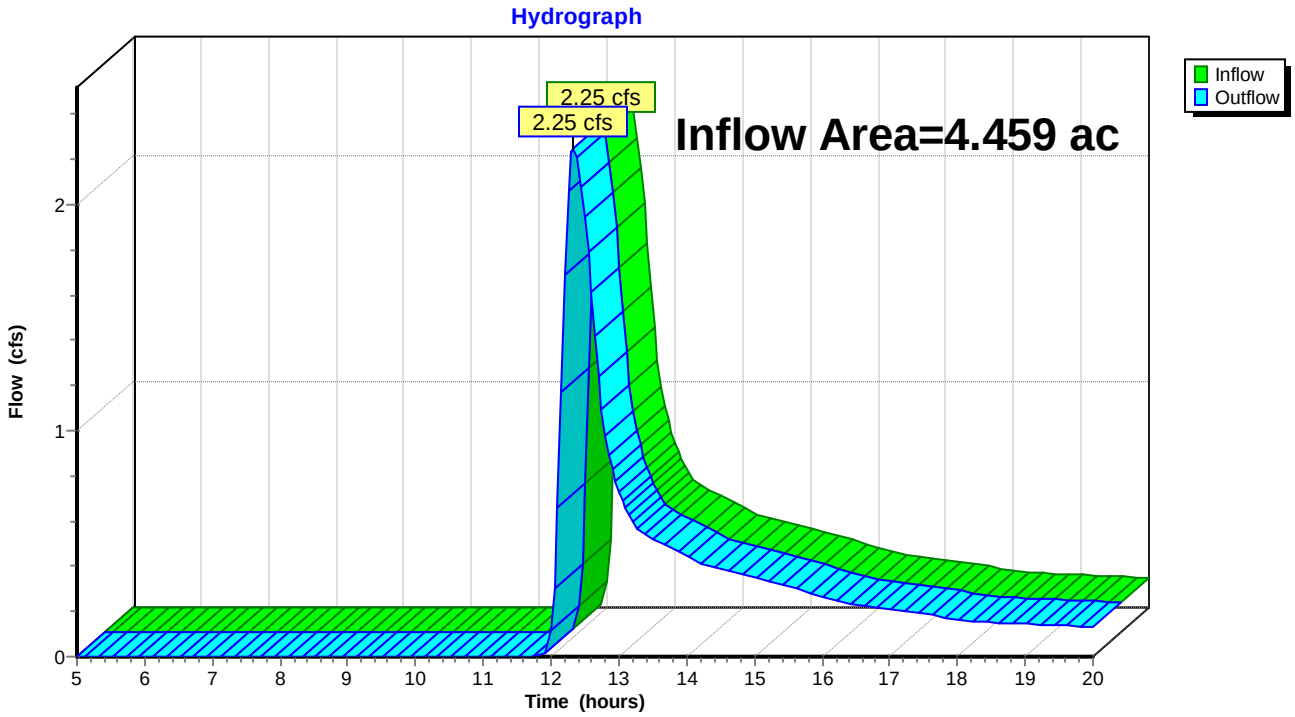


Summary for Reach SP1: Study Point 1

Inflow Area = 4.459 ac, 14.94% Impervious, Inflow Depth > 0.74" for 25 Year Event event
Inflow = 2.25 cfs @ 12.33 hrs, Volume= 0.276 af
Outflow = 2.25 cfs @ 12.33 hrs, Volume= 0.276 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP1: Study Point 1

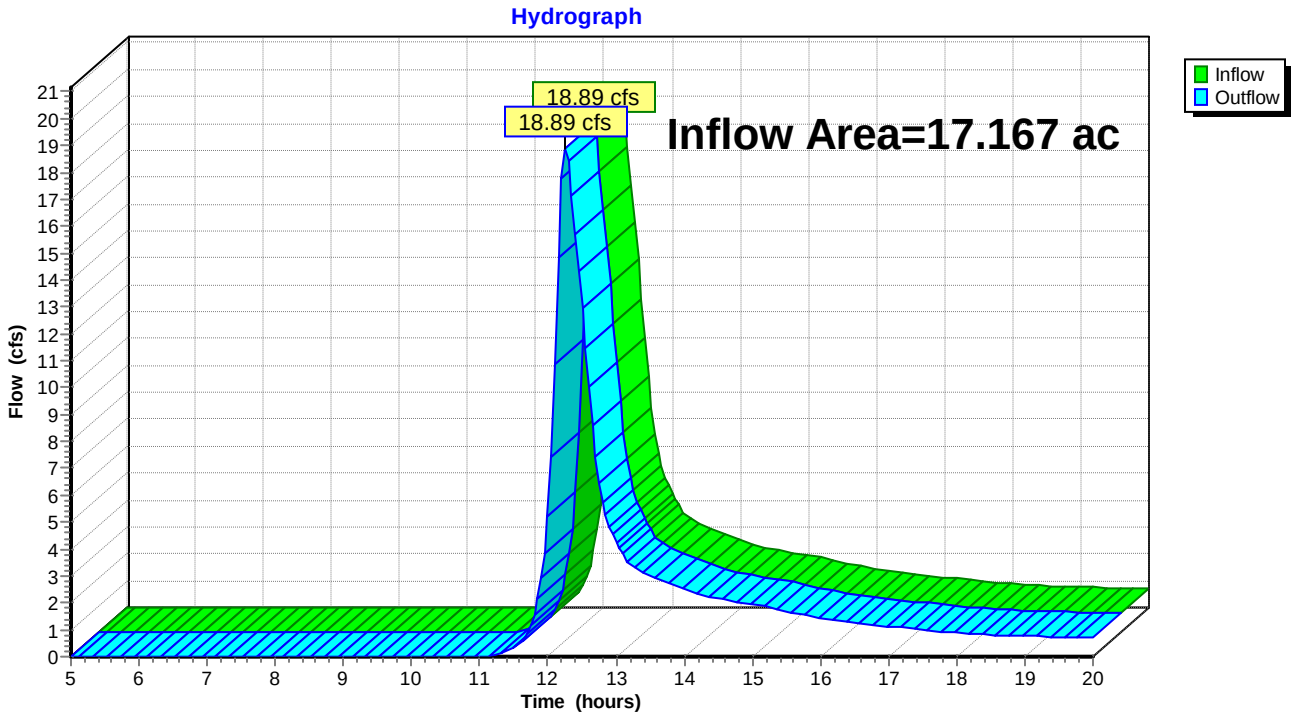


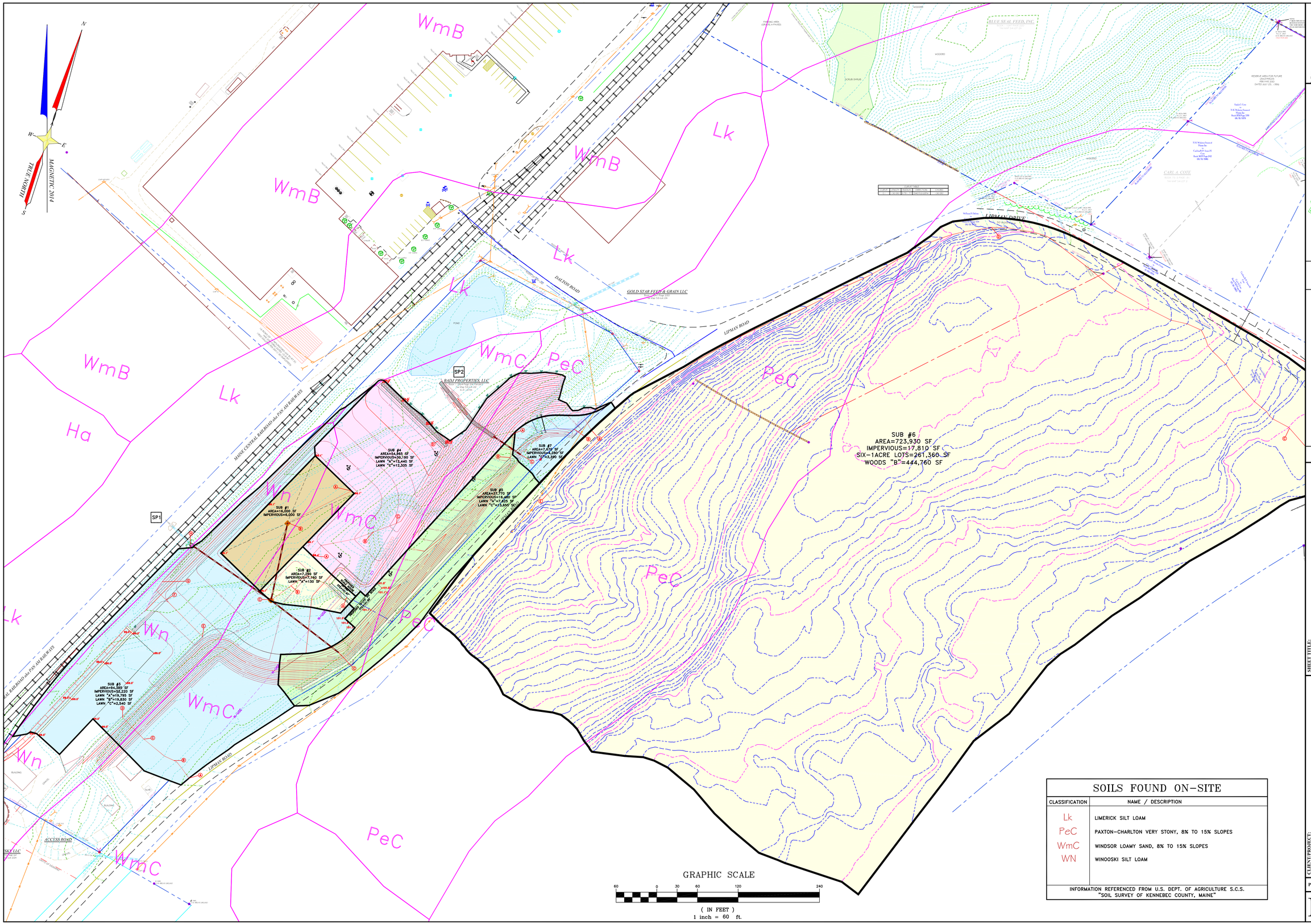
Summary for Reach SP2: Study Point 2

Inflow Area = 17.167 ac, 7.31% Impervious, Inflow Depth > 1.30" for 25 Year Event event
Inflow = 18.89 cfs @ 12.26 hrs, Volume= 1.866 af
Outflow = 18.89 cfs @ 12.26 hrs, Volume= 1.866 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP2: Study Point 2





SOILS FOUND ON-SITE

CLASSIFICATION	NAME / DESCRIPTION
Lk	LIMERICK SILT LOAM
PeC	PAXTON-CHARLTON VERY STONY, 8% TO 15% SLOPES
WmC	WINDSOR LOAMY SAND, 8% TO 15% SLOPES
WN	WINOOSKI SILT LOAM

INFORMATION REFERENCED FROM U.S. DEPT. OF AGRICULTURE S.C.S. "SOIL SURVEY OF KENNEBEC COUNTY, MAINE"

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)

1 inch = 60 ft.

STATE OF MAINE
JAMES E. COFFIN
8500
LICENSED PROFESSIONAL ENGINEER

E.S. COFFIN ENGINEERING & SURVEYING, INC.
© 2015
432 Cony Road P.O. Box 4687 Augusta, Maine 04330
Ph. (207) 623-9475 Fax (207) 623-0016 Toll Free 1-800-244-9475

DATE

REVISIONS

NO.

SHEET TITLE: POST-DEVELOPMENT PLAN

SCALE: 1 INCH=60 FEET

DATE: JANUARY 9, 2015

DRAWN BY: TGH

CHECKED BY: JEC

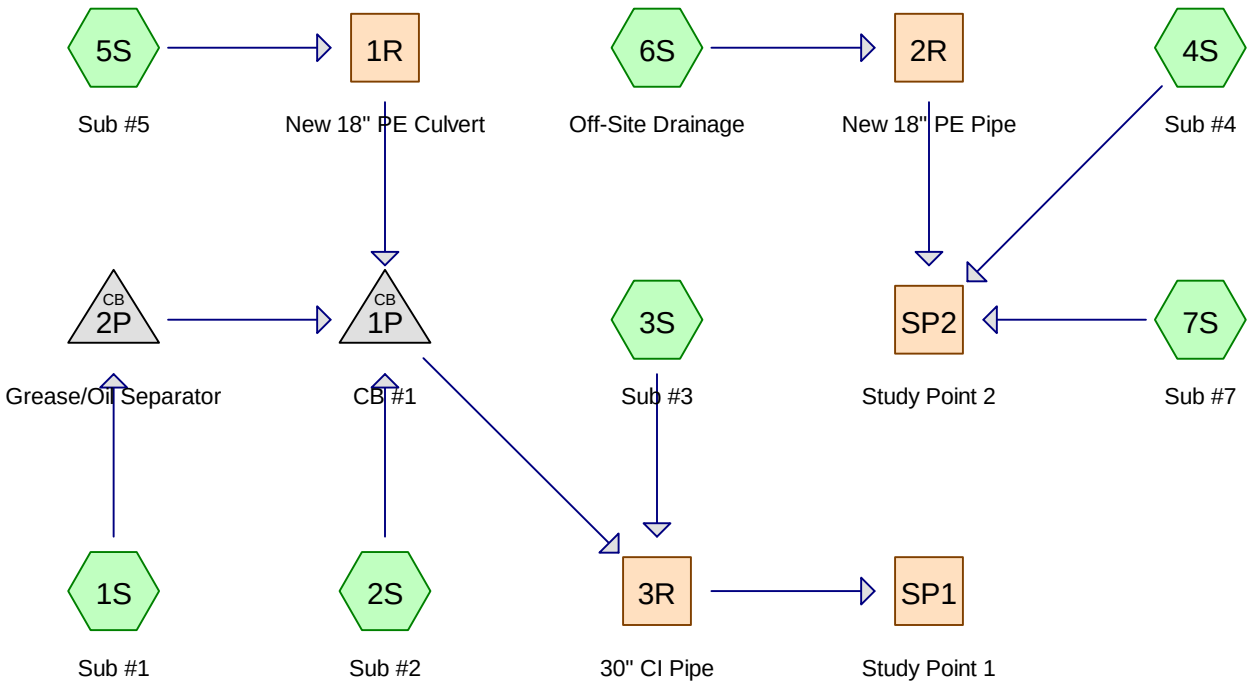
CLIENT/PROJECT: BADJ PROPERTIES, LLC. JOHN CLARK

LOCATION: 79 LIPMAN ROAD

TOWN: AUGUSTA COUNTY: KENNEBEC STATE: MAINE

PROJ. NO. 2014-281

POST



Subcat Reach Pond Link

Routing Diagram for BADJ PROPERTIES POST-DEV.
Prepared by Microsoft, Printed 1/16/2015

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Sub #1 Runoff Area=16,000 sf 100.00% Impervious Runoff Depth>2.59"
Flow Length=105' Slope=0.0100 '/' Tc=1.7 min CN=98 Runoff=1.16 cfs 0.079 af

Subcatchment 2S: Sub #2 Runoff Area=7,290 sf 98.22% Impervious Runoff Depth>2.50"
Flow Length=135' Tc=1.5 min CN=97 Runoff=0.52 cfs 0.035 af

Subcatchment 3S: Sub #3 Runoff Area=94,385 sf 55.33% Impervious Runoff Depth>0.98"
Flow Length=489' Tc=5.7 min CN=77 Runoff=2.60 cfs 0.177 af

Subcatchment 4S: Sub #4 Runoff Area=54,965 sf 54.93% Impervious Runoff Depth>1.09"
Flow Length=283' Tc=1.9 min CN=79 Runoff=1.90 cfs 0.115 af

Subcatchment 5S: Sub #5 Runoff Area=37,760 sf 43.64% Impervious Runoff Depth>0.98"
Flow Length=422' Tc=1.2 min CN=77 Runoff=1.15 cfs 0.071 af

Subcatchment 6S: Off-Site Drainage Runoff Area=723,930 sf 7.22% Impervious Runoff Depth>0.31"
Flow Length=1,426' Tc=17.1 min CN=61 Runoff=3.00 cfs 0.435 af

Subcatchment 7S: Sub #7 Runoff Area=7,670 sf 55.80% Impervious Runoff Depth>1.63"
Flow Length=132' Tc=0.7 min CN=87 Runoff=0.40 cfs 0.024 af

Reach 1R: New 18" PE Culvert Avg. Flow Depth=0.24' Max Vel=6.32 fps Inflow=1.15 cfs 0.071 af
18.0" Round Pipe n=0.013 L=124.0' S=0.0395 '/' Capacity=20.88 cfs Outflow=1.14 cfs 0.071 af

Reach 2R: New 18" PE Pipe Avg. Flow Depth=0.33' Max Vel=10.43 fps Inflow=3.00 cfs 0.435 af
18.0" Round Pipe n=0.013 L=48.0' S=0.0729 '/' Capacity=28.36 cfs Outflow=3.00 cfs 0.435 af

Reach 3R: 30" CI Pipe Avg. Flow Depth=0.51' Max Vel=7.04 fps Inflow=5.04 cfs 0.362 af
30.0" Round Pipe n=0.013 L=38.0' S=0.0184 '/' Capacity=55.67 cfs Outflow=5.01 cfs 0.362 af

Reach SP1: Study Point 1 Inflow=5.01 cfs 0.362 af
Outflow=5.01 cfs 0.362 af

Reach SP2: Study Point 2 Inflow=3.70 cfs 0.574 af
Outflow=3.70 cfs 0.574 af

Pond 1P: CB #1 Peak Elev=91.68' Inflow=2.80 cfs 0.185 af
18.0" Round Culvert n=0.013 L=138.0' S=0.0101 '/' Outflow=2.80 cfs 0.185 af

Pond 2P: Grease/Oil Separator Peak Elev=97.11' Inflow=1.16 cfs 0.079 af
6.0" Round Culvert n=0.013 L=112.0' S=0.0098 '/' Outflow=1.16 cfs 0.079 af

Total Runoff Area = 21.625 ac Runoff Volume = 0.936 af Average Runoff Depth = 0.52"
81.04% Pervious = 17.525 ac 18.96% Impervious = 4.100 ac

Summary for Subcatchment 1S: Sub #1

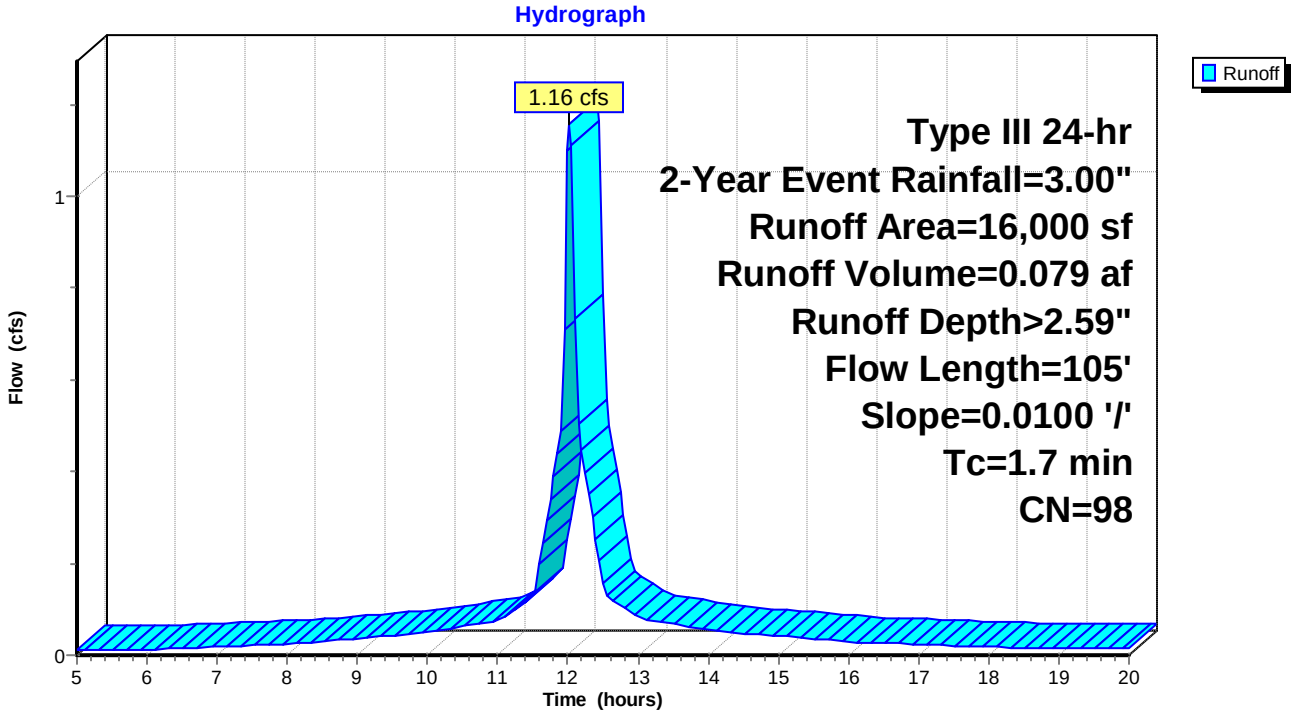
Runoff = 1.16 cfs @ 12.03 hrs, Volume= 0.079 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
16,000	98	Water Surface, HSG C
16,000		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	105	0.0100	1.02		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"

Subcatchment 1S: Sub #1



Summary for Subcatchment 2S: Sub #2

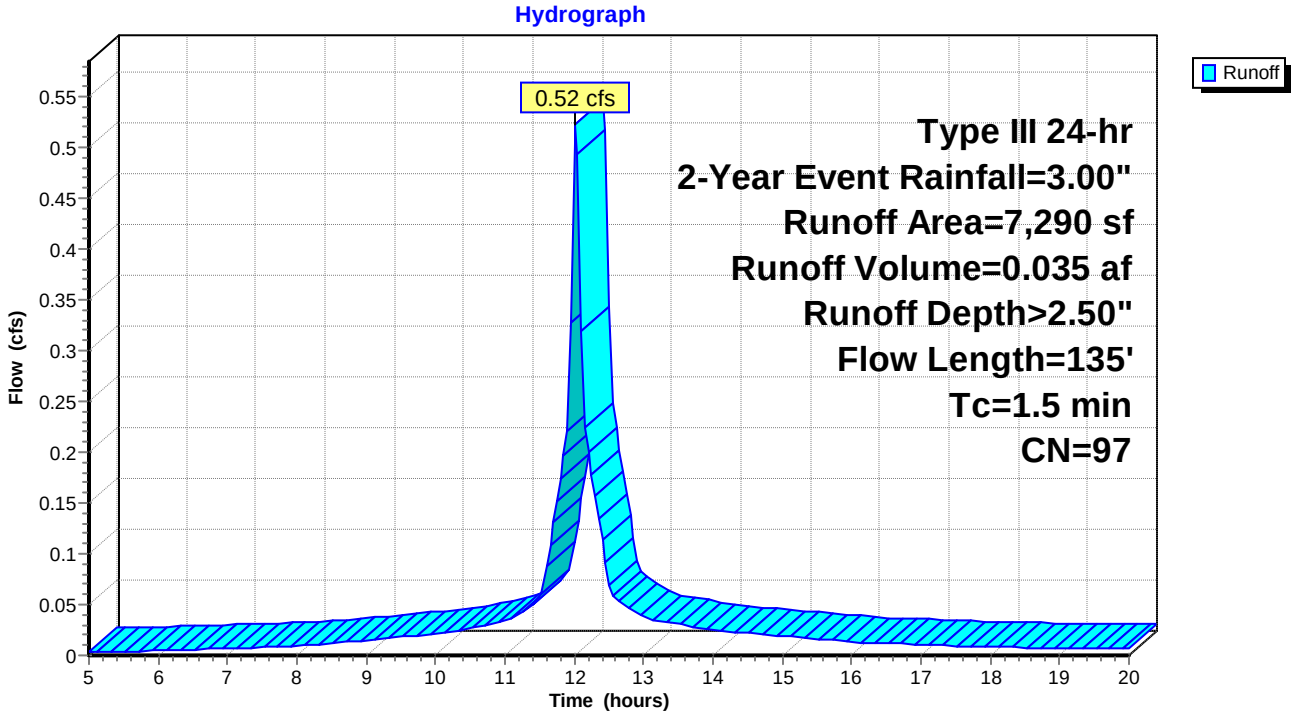
Runoff = 0.52 cfs @ 12.02 hrs, Volume= 0.035 af, Depth> 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
7,160	98	Water Surface, HSG C
130	39	>75% Grass cover, Good, HSG A
7,290	97	Weighted Average
130		1.78% Pervious Area
7,160		98.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0200	1.33		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.2	35	0.0257	3.25		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
1.5	135	Total			

Subcatchment 2S: Sub #2



Summary for Subcatchment 3S: Sub #3

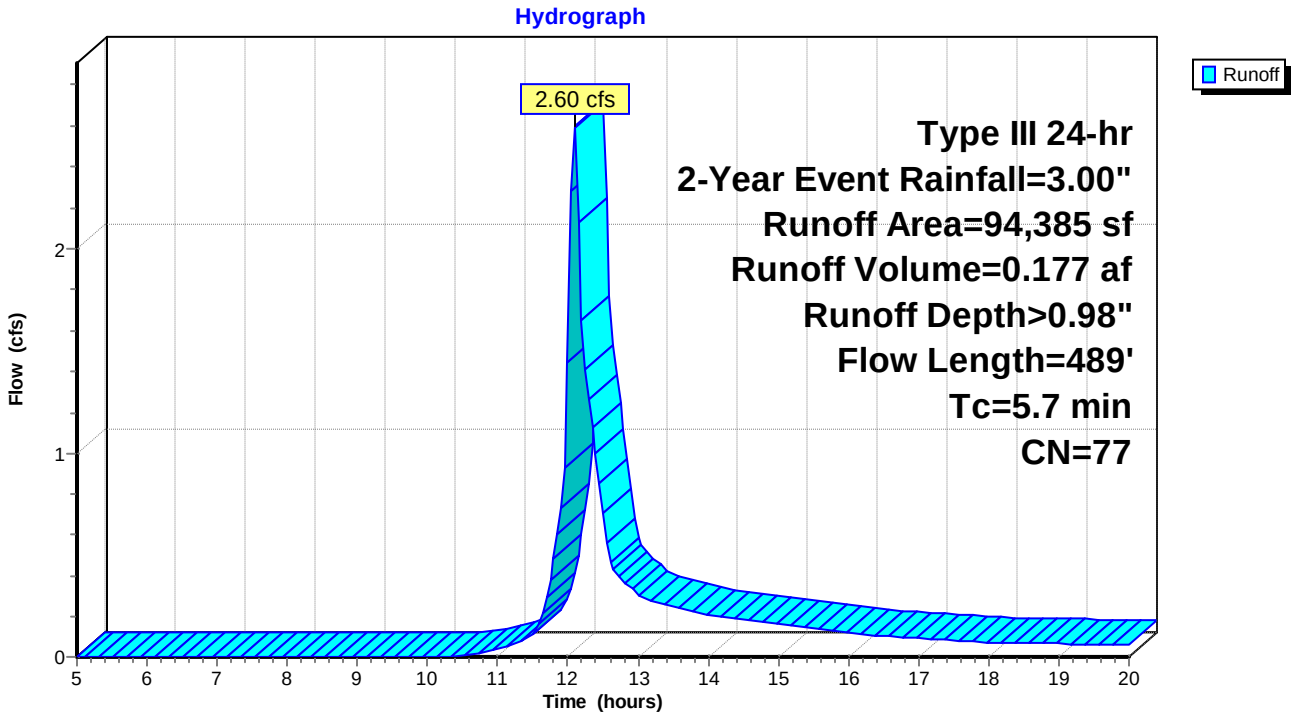
Runoff = 2.60 cfs @ 12.10 hrs, Volume= 0.177 af, Depth> 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
52,220	98	Water Surface, HSG C
19,795	39	>75% Grass cover, Good, HSG A
19,830	61	>75% Grass cover, Good, HSG B
2,540	74	>75% Grass cover, Good, HSG C
94,385	77	Weighted Average
42,165		44.67% Pervious Area
52,220		55.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	35	0.0400	0.18		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.00"
0.8	55	0.0200	1.18		**Sheet Flow, BC** Smooth surfaces n= 0.011 P2= 3.00"
0.1	45	0.3333	8.66		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
0.7	169	0.0100	3.98	15.92	**Channel Flow, DE** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.025 Earth, clean & straight
0.5	76	0.0132	2.33		**Shallow Concentrated Flow, EF** Paved Kv= 20.3 fps
0.1	36	0.1389	5.59		**Shallow Concentrated Flow, FG** Grassed Waterway Kv= 15.0 fps
0.2	73	0.0274	6.59	26.35	**Channel Flow, GH** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.025 Earth, clean & straight
5.7	489	Total			

Subcatchment 3S: Sub #3



Summary for Subcatchment 4S: Sub #4

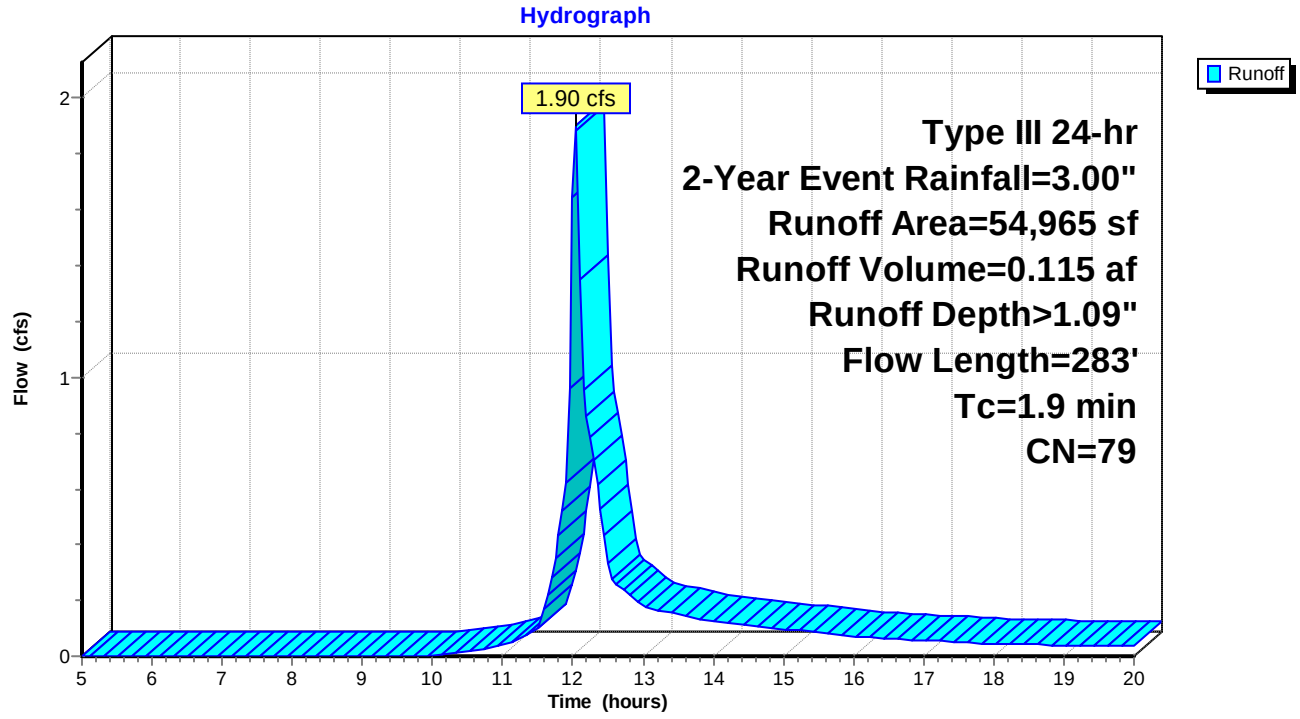
Runoff = 1.90 cfs @ 12.04 hrs, Volume= 0.115 af, Depth> 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
30,190	98	Water Surface, HSG C
12,440	39	>75% Grass cover, Good, HSG A
12,335	74	>75% Grass cover, Good, HSG C
54,965	79	Weighted Average
24,775		45.07% Pervious Area
30,190		54.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0180	1.28		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.2	36	0.0200	2.87		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
0.4	147	0.0259	6.41	25.62	**Channel Flow, CD** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.025 Earth, clean & straight
1.9	283	Total			

Subcatchment 4S: Sub #4



Summary for Subcatchment 5S: Sub #5

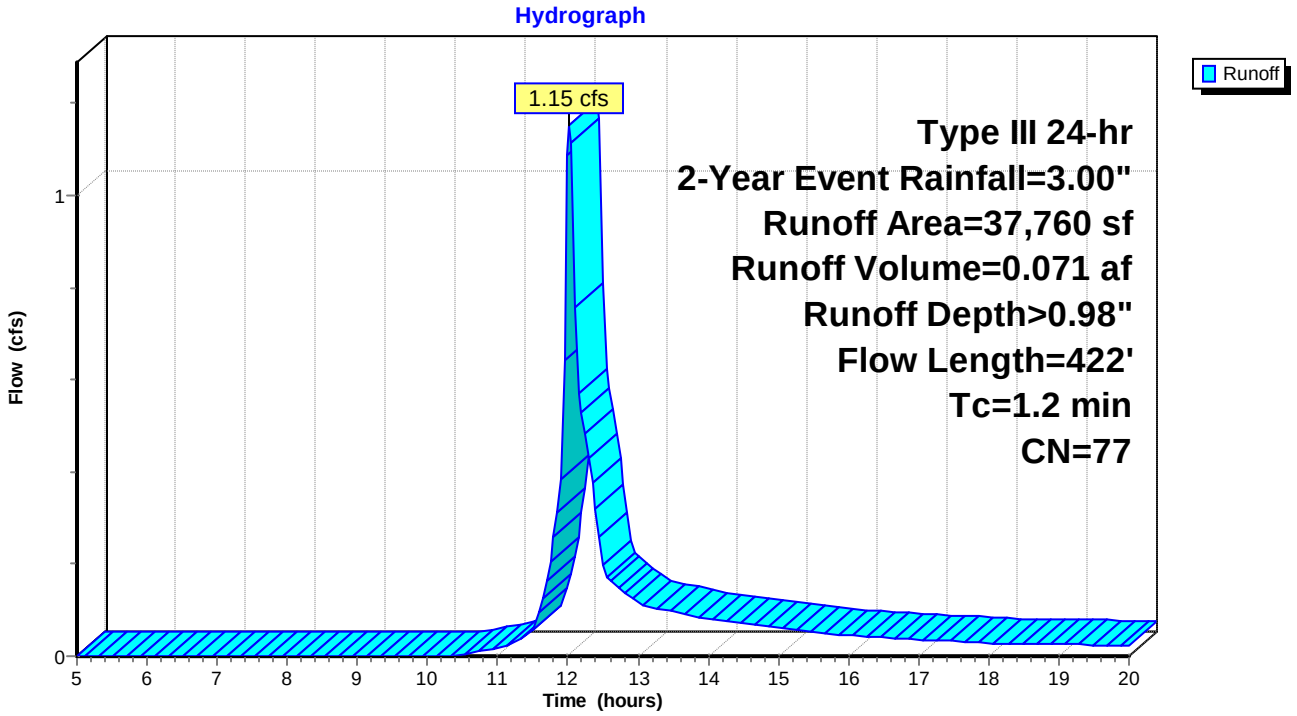
Runoff = 1.15 cfs @ 12.03 hrs, Volume= 0.071 af, Depth> 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
16,480	98	Water Surface, HSG C
7,625	39	>75% Grass cover, Good, HSG A
13,655	74	>75% Grass cover, Good, HSG C
37,760	77	Weighted Average
21,280		56.36% Pervious Area
16,480		43.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	35	0.0500	1.56		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.8	387	0.0449	8.43	33.74	**Channel Flow, BC** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.025 Earth, clean & straight
1.2	422	Total			

Subcatchment 5S: Sub #5



Summary for Subcatchment 6S: Off-Site Drainage

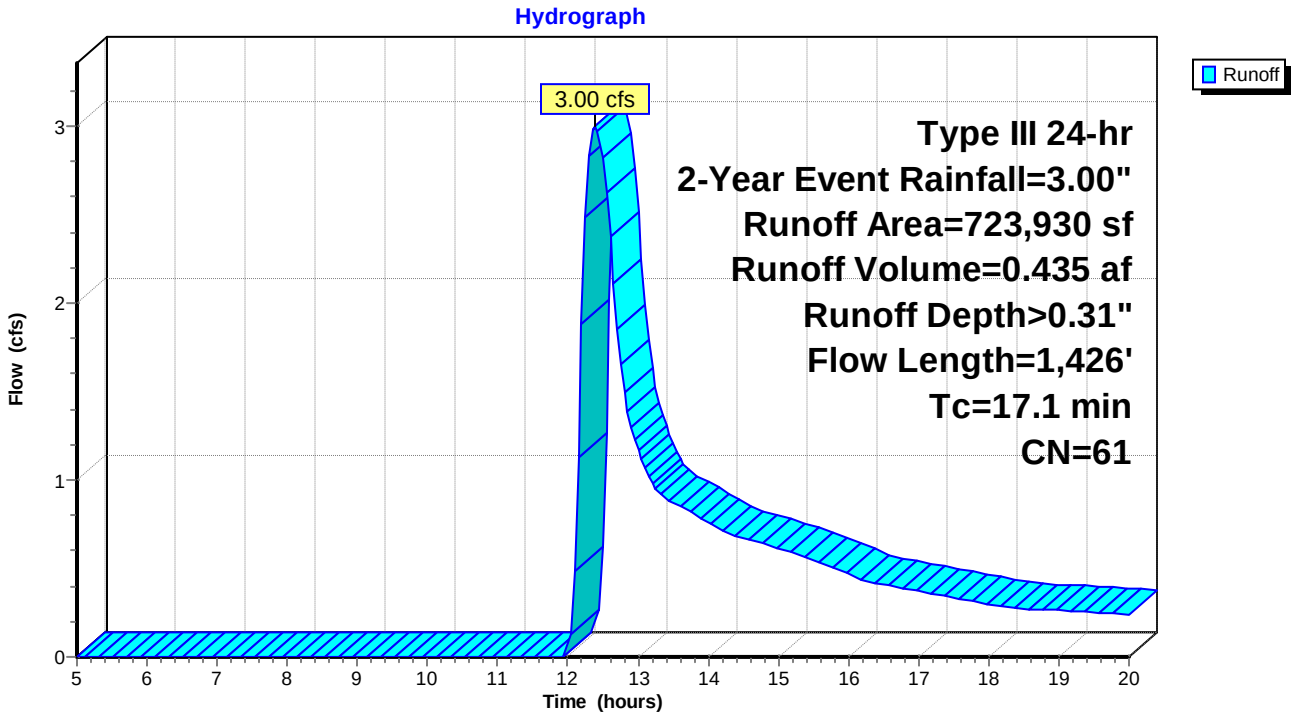
Runoff = 3.00 cfs @ 12.39 hrs, Volume= 0.435 af, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
17,810	98	Water Surface, 0% imp, HSG C
261,360	68	1 acre lots, 20% imp, HSG B
444,760	55	Woods, Good, HSG B
723,930	61	Weighted Average
671,658		92.78% Pervious Area
52,272		7.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0200	0.76		**Sheet Flow, AB**
					Smooth surfaces n= 0.011 P2= 3.00"
9.4	94	0.0213	0.17		**Sheet Flow, BC**
					Grass: Short n= 0.150 P2= 3.00"
6.3	550	0.0836	1.45		**Shallow Concentrated Flow, CD**
					Woodland Kv= 5.0 fps
1.3	776	0.0657	9.69	58.13	**Channel Flow, DE**
					Area= 6.0 sf Perim= 9.0' r= 0.67'
					n= 0.030 Earth, clean & winding
17.1	1,426	Total			

Subcatchment 6S: Off-Site Drainage



Summary for Subcatchment 7S: Sub #7

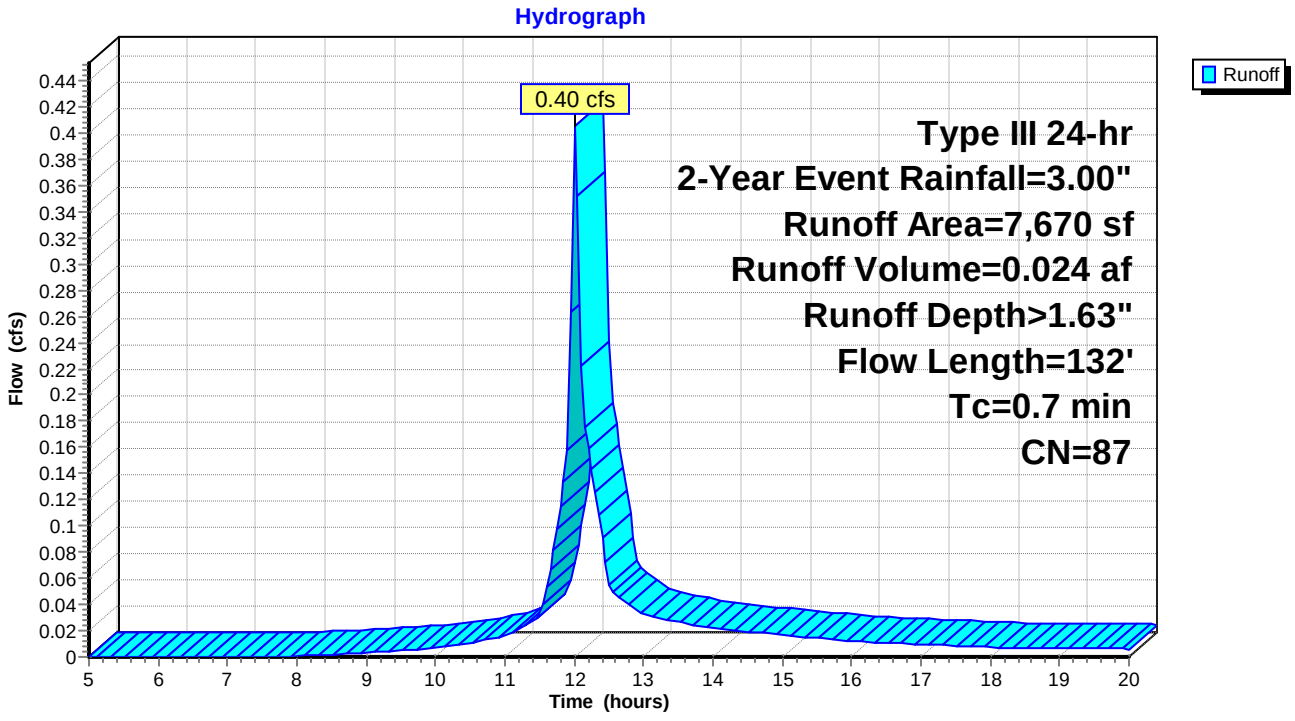
Runoff = 0.40 cfs @ 12.01 hrs, Volume= 0.024 af, Depth> 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
4,280	98	Water Surface, HSG C
3,390	74	>75% Grass cover, Good, HSG C
7,670	87	Weighted Average
3,390		44.20% Pervious Area
4,280		55.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	39	0.0256	1.22		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.2	93	0.0753	9.10	36.41	**Channel Flow, BC** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.030 Earth, clean & winding
0.7	132	Total			

Subcatchment 7S: Sub #7



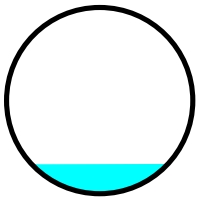
Summary for Reach 1R: New 18" PE Culvert

Inflow Area = 0.867 ac, 43.64% Impervious, Inflow Depth > 0.98" for 2-Year Event event
Inflow = 1.15 cfs @ 12.03 hrs, Volume= 0.071 af
Outflow = 1.14 cfs @ 12.04 hrs, Volume= 0.071 af, Atten= 1%, Lag= 0.7 min

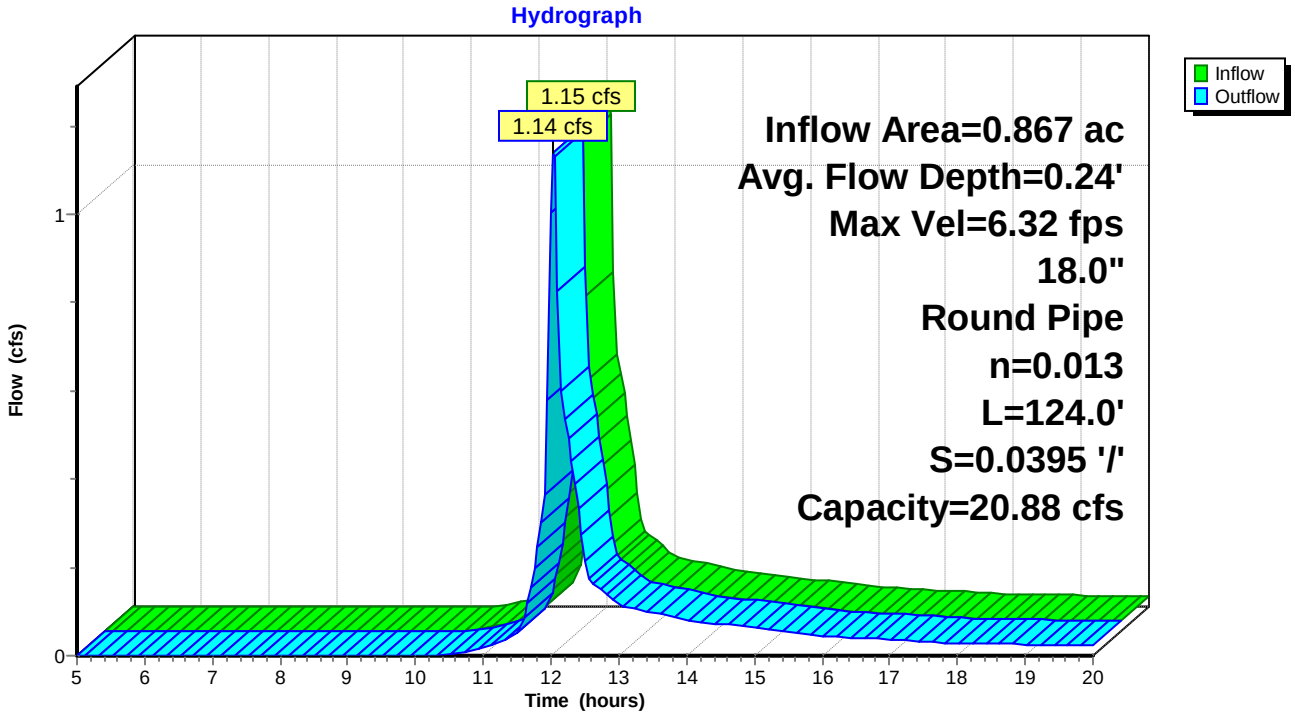
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.32 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.57 fps, Avg. Travel Time= 0.8 min

Peak Storage= 23 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 20.88 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 124.0' Slope= 0.0395 '/'
Inlet Invert= 96.00', Outlet Invert= 91.10'



Reach 1R: New 18" PE Culvert



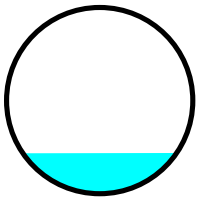
Summary for Reach 2R: New 18" PE Pipe

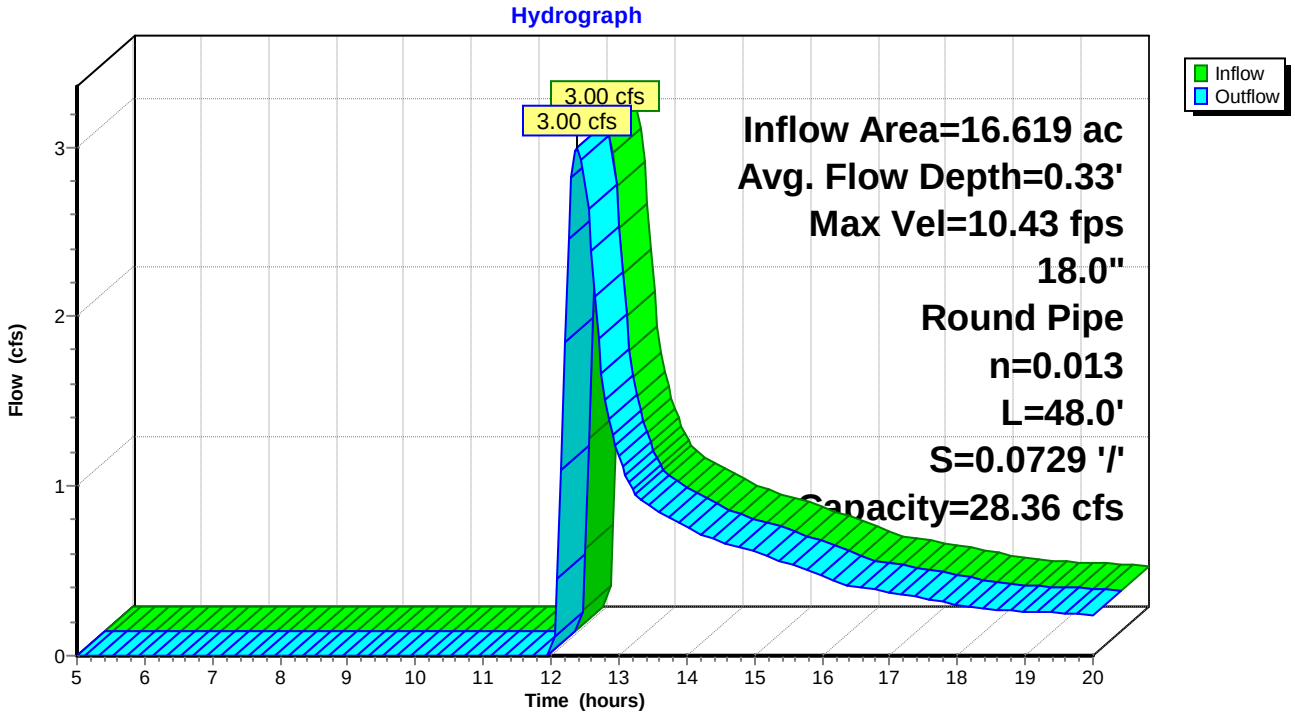
Inflow Area = 16.619 ac, 7.22% Impervious, Inflow Depth > 0.31" for 2-Year Event event
Inflow = 3.00 cfs @ 12.39 hrs, Volume= 0.435 af
Outflow = 3.00 cfs @ 12.39 hrs, Volume= 0.435 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.43 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 6.23 fps, Avg. Travel Time= 0.1 min

Peak Storage= 14 cf @ 12.39 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 28.36 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 48.0' Slope= 0.0729 '/'
Inlet Invert= 111.50', Outlet Invert= 108.00'





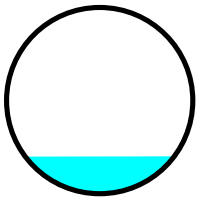
Summary for Reach 3R: 30" CI Pipe

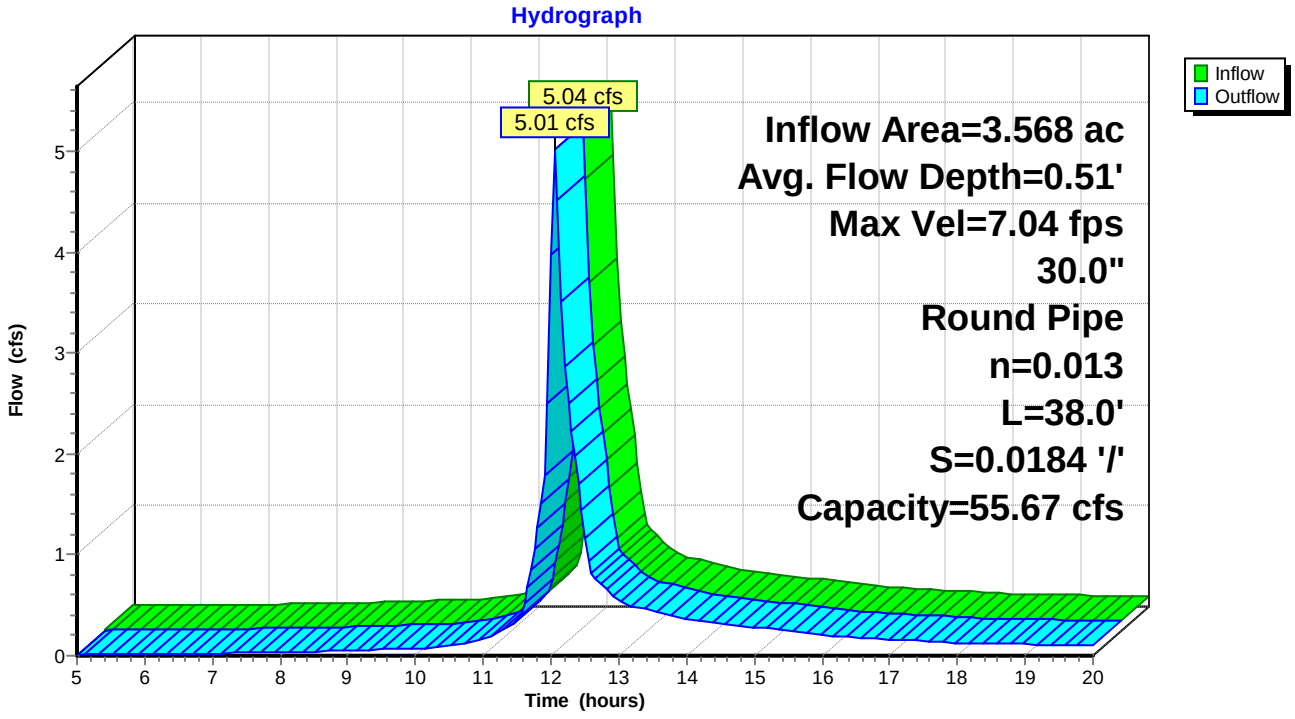
Inflow Area = 3.568 ac, 59.10% Impervious, Inflow Depth > 1.22" for 2-Year Event event
Inflow = 5.04 cfs @ 12.06 hrs, Volume= 0.362 af
Outflow = 5.01 cfs @ 12.06 hrs, Volume= 0.362 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.04 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.50 fps, Avg. Travel Time= 0.3 min

Peak Storage= 27 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 55.67 cfs

30.0" Round Pipe
n= 0.013 Cast iron, coated
Length= 38.0' Slope= 0.0184 '/'
Inlet Invert= 89.00', Outlet Invert= 88.30'



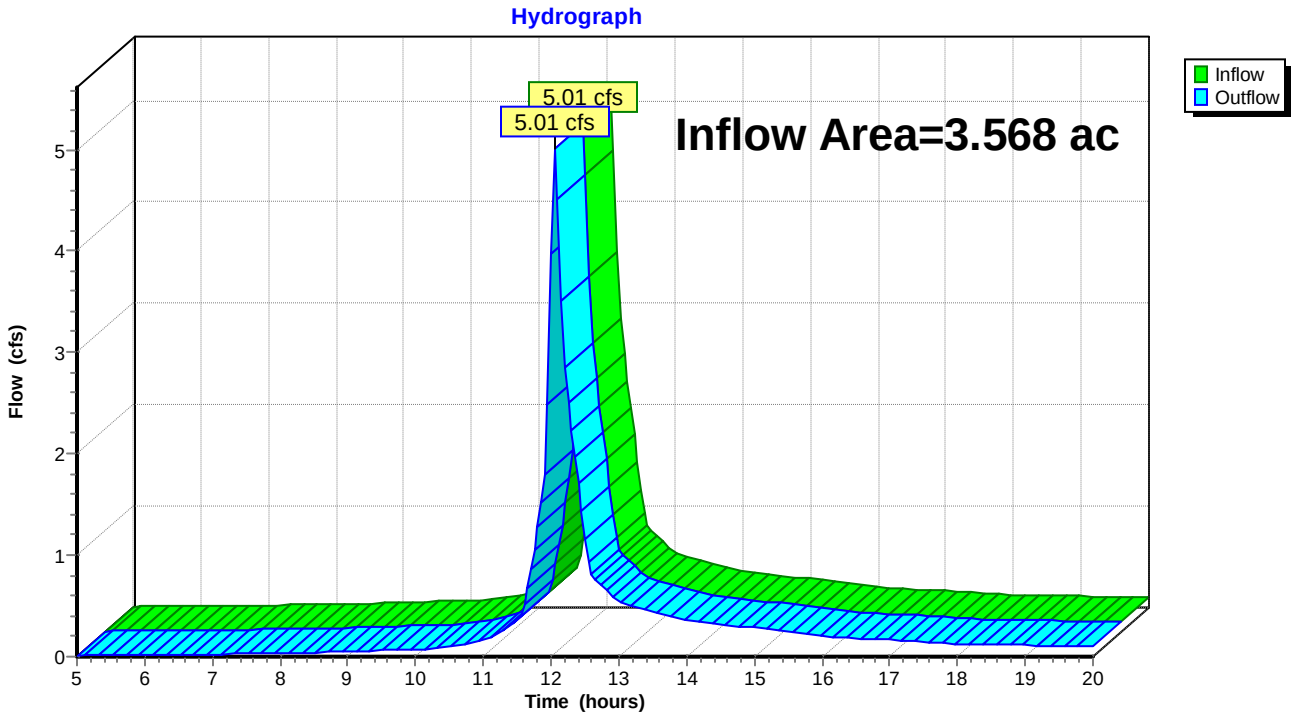


Summary for Reach SP1: Study Point 1

Inflow Area = 3.568 ac, 59.10% Impervious, Inflow Depth > 1.22" for 2-Year Event event
Inflow = 5.01 cfs @ 12.06 hrs, Volume= 0.362 af
Outflow = 5.01 cfs @ 12.06 hrs, Volume= 0.362 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP1: Study Point 1

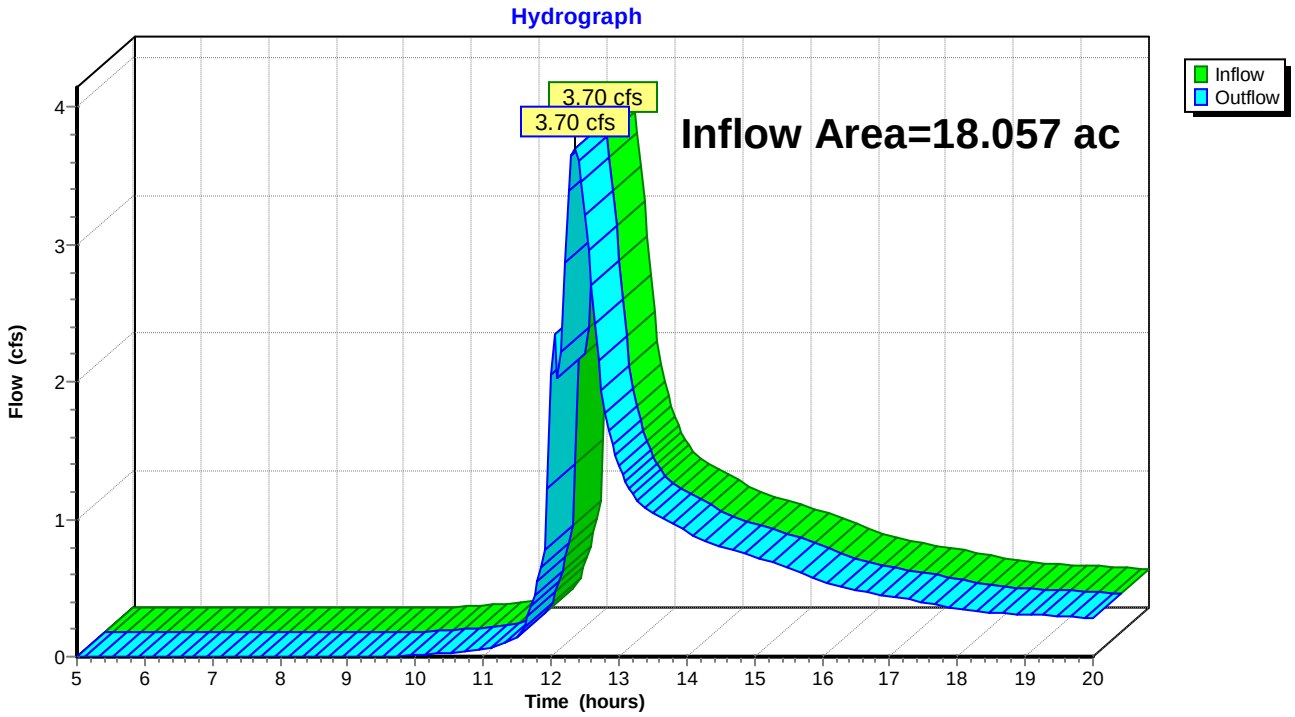


Summary for Reach SP2: Study Point 2

Inflow Area = 18.057 ac, 11.03% Impervious, Inflow Depth > 0.38" for 2-Year Event event
Inflow = 3.70 cfs @ 12.34 hrs, Volume= 0.574 af
Outflow = 3.70 cfs @ 12.34 hrs, Volume= 0.574 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP2: Study Point 2



Summary for Pond 1P: CB #1

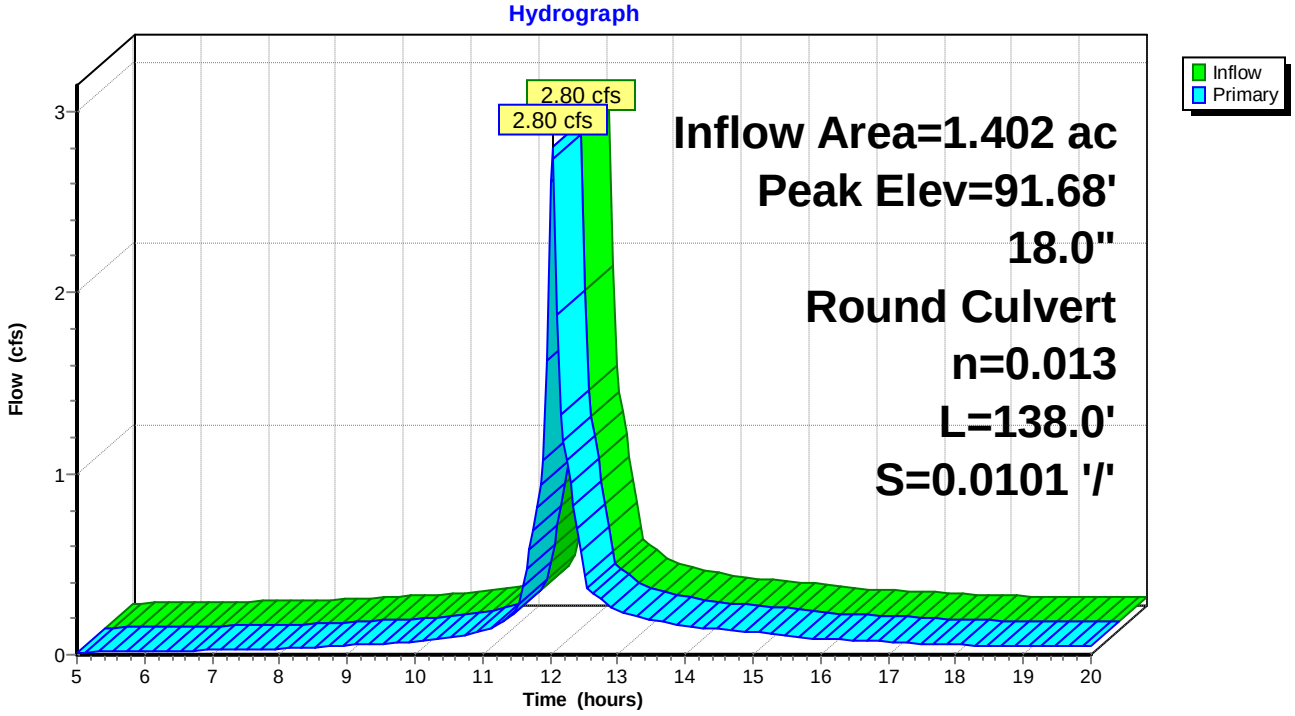
Inflow Area = 1.402 ac, 64.93% Impervious, Inflow Depth > 1.59" for 2-Year Event event
Inflow = 2.80 cfs @ 12.03 hrs, Volume= 0.185 af
Outflow = 2.80 cfs @ 12.03 hrs, Volume= 0.185 af, Atten= 0%, Lag= 0.0 min
Primary = 2.80 cfs @ 12.03 hrs, Volume= 0.185 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 91.68' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	90.90'	**18.0" Round Culvert** L= 138.0' Ke= 0.500 Inlet / Outlet Invert= 90.90' / 89.50' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.69 cfs @ 12.03 hrs HW=91.66' (Free Discharge)
1=Culvert (Inlet Controls 2.69 cfs @ 2.98 fps)

Pond 1P: CB #1



Summary for Pond 2P: Grease/Oil Separator

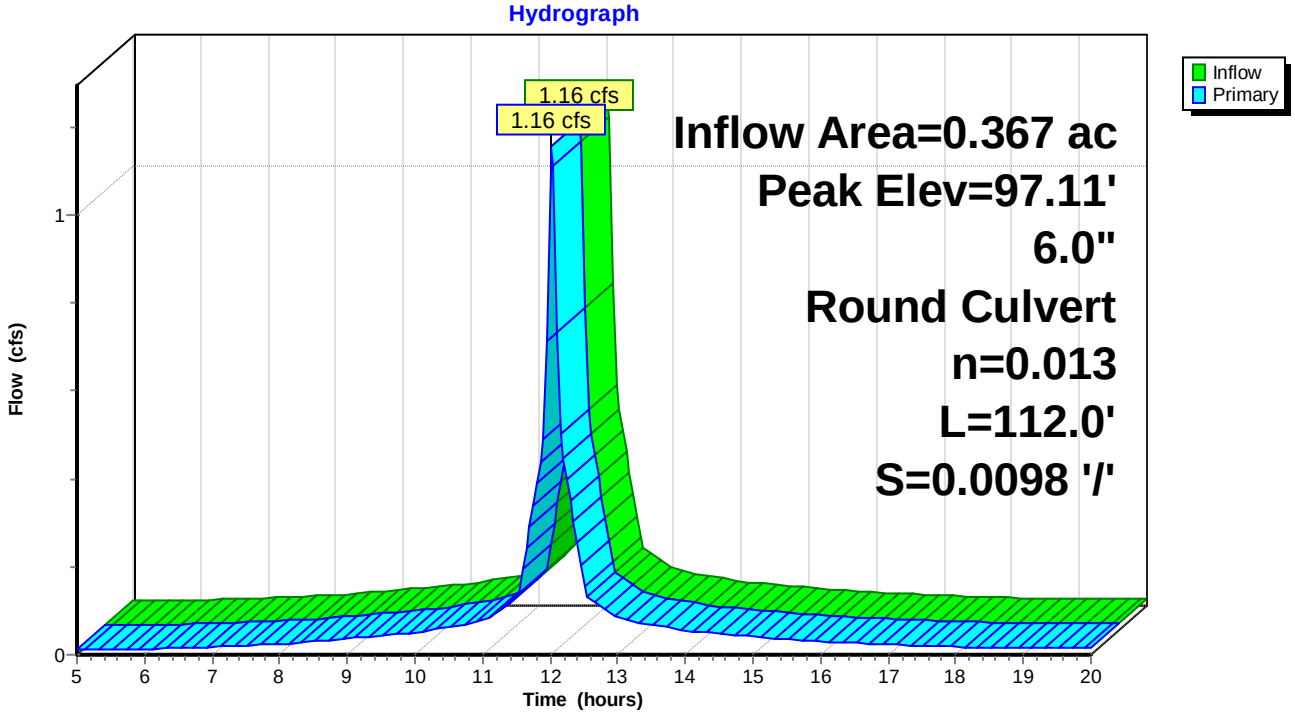
Inflow Area = 0.367 ac,100.00% Impervious, Inflow Depth > 2.59" for 2-Year Event event
Inflow = 1.16 cfs @ 12.03 hrs, Volume= 0.079 af
Outflow = 1.16 cfs @ 12.03 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min
Primary = 1.16 cfs @ 12.03 hrs, Volume= 0.079 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 97.11' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	92.20'	**6.0" Round Culvert** L= 112.0' Ke= 0.500 Inlet / Outlet Invert= 92.20' / 91.10' S= 0.0098 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=1.11 cfs @ 12.03 hrs HW=96.73' (Free Discharge)
1=Culvert (Barrel Controls 1.11 cfs @ 5.65 fps)

Pond 2P: Grease/Oil Separator



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Sub #1 Runoff Area=16,000 sf 100.00% Impervious Runoff Depth>3.87"
Flow Length=105' Slope=0.0100 '/' Tc=1.7 min CN=98 Runoff=1.71 cfs 0.119 af

Subcatchment 2S: Sub #2 Runoff Area=7,290 sf 98.22% Impervious Runoff Depth>3.79"
Flow Length=135' Tc=1.5 min CN=97 Runoff=0.78 cfs 0.053 af

Subcatchment 3S: Sub #3 Runoff Area=94,385 sf 55.33% Impervious Runoff Depth>1.98"
Flow Length=489' Tc=5.7 min CN=77 Runoff=5.33 cfs 0.357 af

Subcatchment 4S: Sub #4 Runoff Area=54,965 sf 54.93% Impervious Runoff Depth>2.14"
Flow Length=283' Tc=1.9 min CN=79 Runoff=3.72 cfs 0.225 af

Subcatchment 5S: Sub #5 Runoff Area=37,760 sf 43.64% Impervious Runoff Depth>1.98"
Flow Length=422' Tc=1.2 min CN=77 Runoff=2.38 cfs 0.143 af

Subcatchment 6S: Off-Site Drainage Runoff Area=723,930 sf 7.22% Impervious Runoff Depth>0.91"
Flow Length=1,426' Tc=17.1 min CN=61 Runoff=12.21 cfs 1.267 af

Subcatchment 7S: Sub #7 Runoff Area=7,670 sf 55.80% Impervious Runoff Depth>2.83"
Flow Length=132' Tc=0.7 min CN=87 Runoff=0.69 cfs 0.042 af

Reach 1R: New 18" PE Culvert Avg. Flow Depth=0.34' Max Vel=7.77 fps Inflow=2.38 cfs 0.143 af
18.0" Round Pipe n=0.013 L=124.0' S=0.0395 '/' Capacity=20.88 cfs Outflow=2.33 cfs 0.143 af

Reach 2R: New 18" PE Pipe Avg. Flow Depth=0.69' Max Vel=15.41 fps Inflow=12.21 cfs 1.267 af
18.0" Round Pipe n=0.013 L=48.0' S=0.0729 '/' Capacity=28.36 cfs Outflow=12.14 cfs 1.266 af

Reach 3R: 30" CI Pipe Avg. Flow Depth=0.70' Max Vel=8.46 fps Inflow=9.51 cfs 0.671 af
30.0" Round Pipe n=0.013 L=38.0' S=0.0184 '/' Capacity=55.67 cfs Outflow=9.48 cfs 0.671 af

Reach SP1: Study Point 1 Inflow=9.48 cfs 0.671 af
Outflow=9.48 cfs 0.671 af

Reach SP2: Study Point 2 Inflow=13.80 cfs 1.533 af
Outflow=13.80 cfs 1.533 af

Pond 1P: CB #1 Peak Elev=91.98' Inflow=4.81 cfs 0.314 af
18.0" Round Culvert n=0.013 L=138.0' S=0.0101 '/' Outflow=4.81 cfs 0.314 af

Pond 2P: Grease/Oil Separator Peak Elev=103.62' Inflow=1.71 cfs 0.119 af
6.0" Round Culvert n=0.013 L=112.0' S=0.0098 '/' Outflow=1.71 cfs 0.119 af

Total Runoff Area = 21.625 ac Runoff Volume = 2.204 af Average Runoff Depth = 1.22"
81.04% Pervious = 17.525 ac 18.96% Impervious = 4.100 ac

Summary for Subcatchment 1S: Sub #1

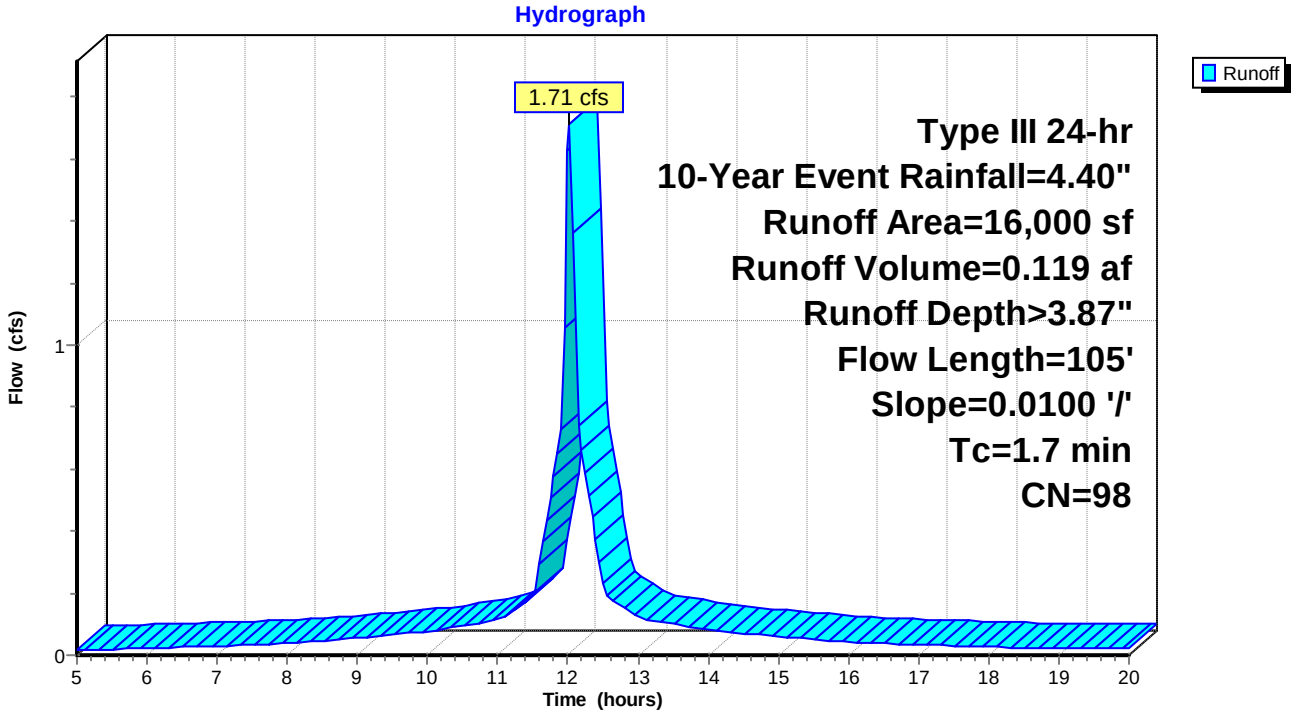
Runoff = 1.71 cfs @ 12.03 hrs, Volume= 0.119 af, Depth> 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
16,000	98	Water Surface, HSG C
16,000		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	105	0.0100	1.02		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"

Subcatchment 1S: Sub #1



Summary for Subcatchment 2S: Sub #2

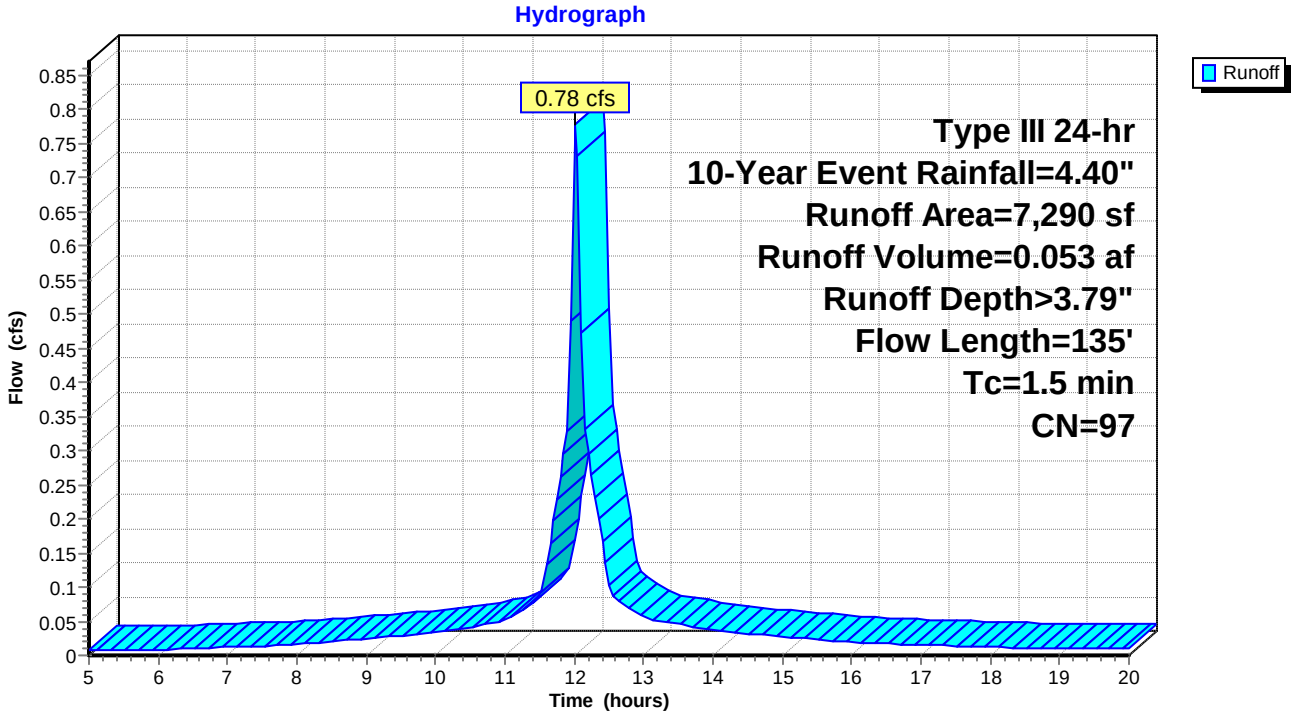
Runoff = 0.78 cfs @ 12.02 hrs, Volume= 0.053 af, Depth> 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
7,160	98	Water Surface, HSG C
130	39	>75% Grass cover, Good, HSG A
7,290	97	Weighted Average
130		1.78% Pervious Area
7,160		98.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0200	1.33		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.2	35	0.0257	3.25		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
1.5	135	Total			

Subcatchment 2S: Sub #2



Summary for Subcatchment 3S: Sub #3

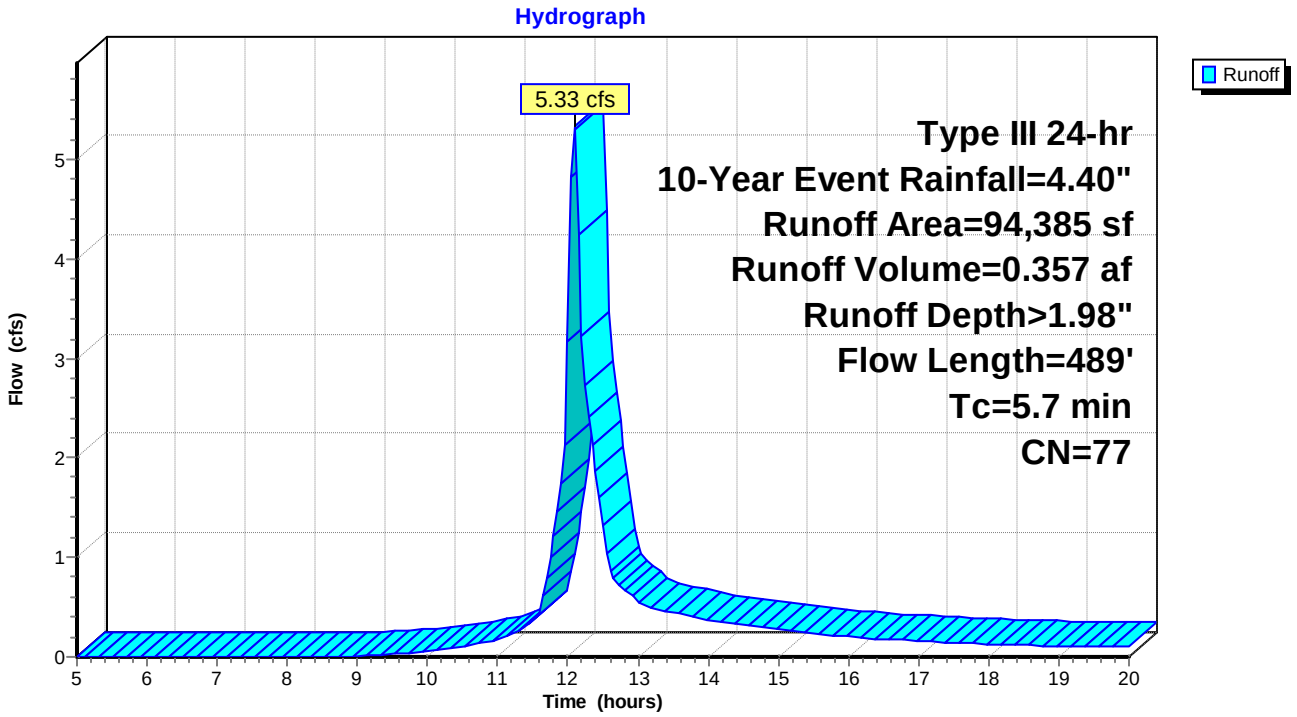
Runoff = 5.33 cfs @ 12.09 hrs, Volume= 0.357 af, Depth> 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
52,220	98	Water Surface, HSG C
19,795	39	>75% Grass cover, Good, HSG A
19,830	61	>75% Grass cover, Good, HSG B
2,540	74	>75% Grass cover, Good, HSG C
94,385	77	Weighted Average
42,165		44.67% Pervious Area
52,220		55.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	35	0.0400	0.18		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.00"
0.8	55	0.0200	1.18		**Sheet Flow, BC** Smooth surfaces n= 0.011 P2= 3.00"
0.1	45	0.3333	8.66		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
0.7	169	0.0100	3.98	15.92	**Channel Flow, DE** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.025 Earth, clean & straight
0.5	76	0.0132	2.33		**Shallow Concentrated Flow, EF** Paved Kv= 20.3 fps
0.1	36	0.1389	5.59		**Shallow Concentrated Flow, FG** Grassed Waterway Kv= 15.0 fps
0.2	73	0.0274	6.59	26.35	**Channel Flow, GH** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.025 Earth, clean & straight
5.7	489	Total			

Subcatchment 3S: Sub #3



Summary for Subcatchment 4S: Sub #4

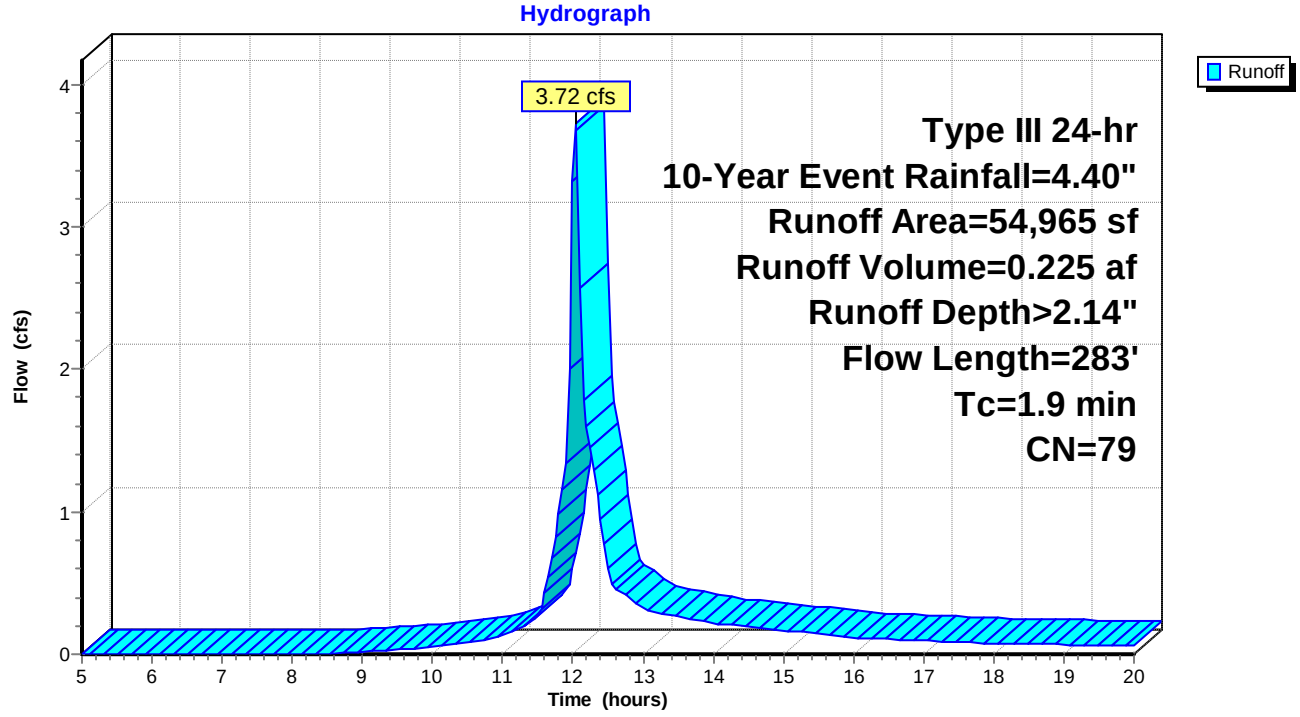
Runoff = 3.72 cfs @ 12.04 hrs, Volume= 0.225 af, Depth> 2.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
30,190	98	Water Surface, HSG C
12,440	39	>75% Grass cover, Good, HSG A
12,335	74	>75% Grass cover, Good, HSG C
54,965	79	Weighted Average
24,775		45.07% Pervious Area
30,190		54.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0180	1.28		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.2	36	0.0200	2.87		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
0.4	147	0.0259	6.41	25.62	**Channel Flow, CD** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.025 Earth, clean & straight
1.9	283	Total			

Subcatchment 4S: Sub #4



Summary for Subcatchment 5S: Sub #5

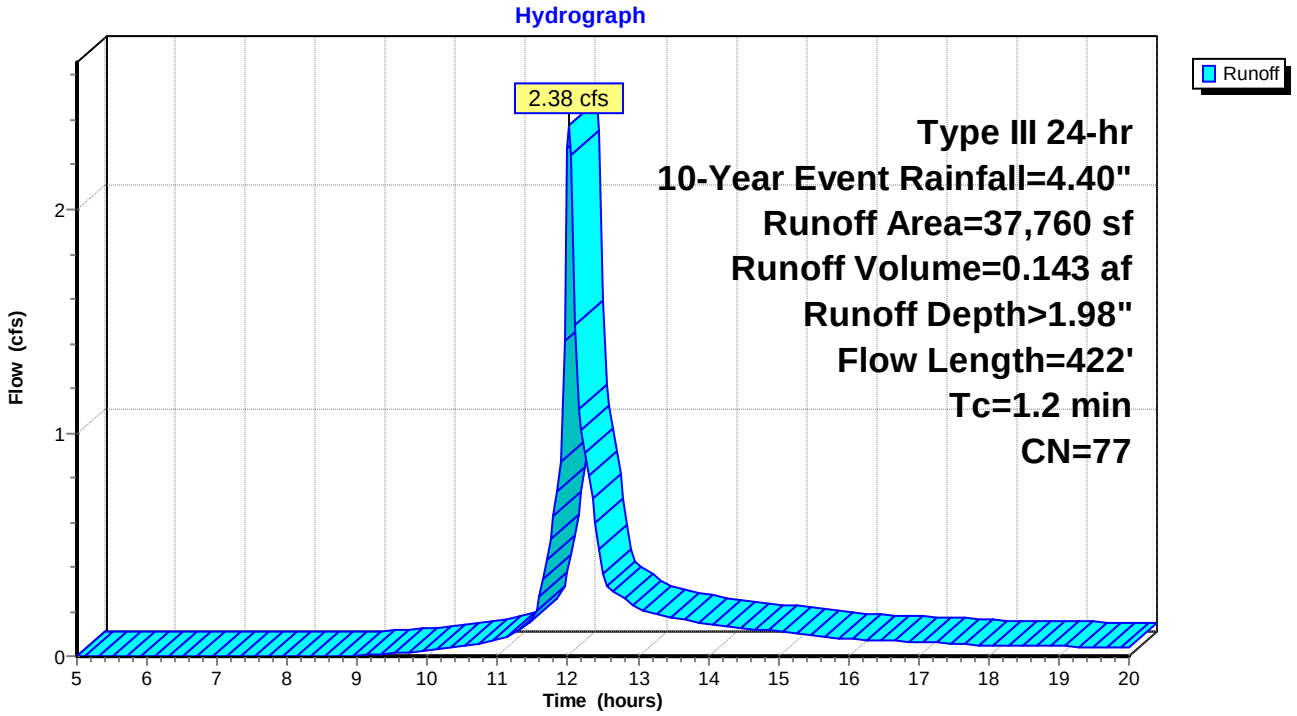
Runoff = 2.38 cfs @ 12.02 hrs, Volume= 0.143 af, Depth> 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
16,480	98	Water Surface, HSG C
7,625	39	>75% Grass cover, Good, HSG A
13,655	74	>75% Grass cover, Good, HSG C
37,760	77	Weighted Average
21,280		56.36% Pervious Area
16,480		43.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	35	0.0500	1.56		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.8	387	0.0449	8.43	33.74	**Channel Flow, BC** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.025 Earth, clean & straight
1.2	422	Total			

Subcatchment 5S: Sub #5



Summary for Subcatchment 6S: Off-Site Drainage

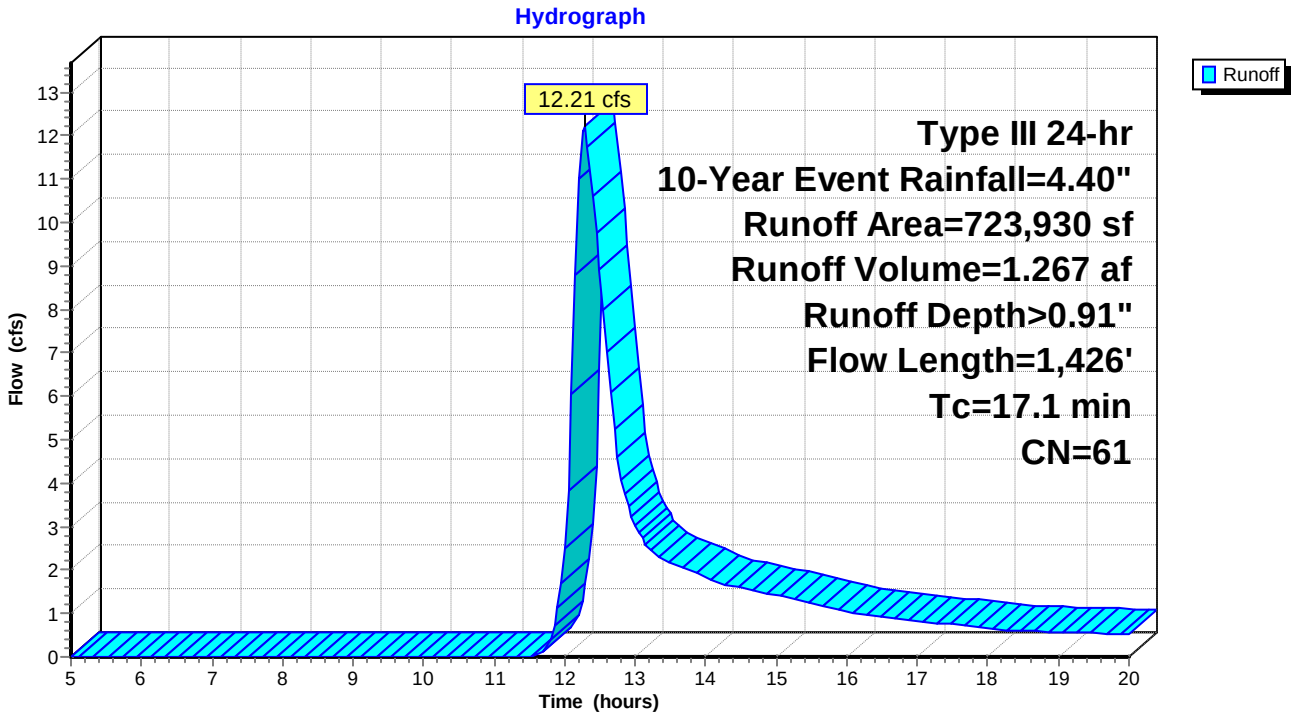
Runoff = 12.21 cfs @ 12.27 hrs, Volume= 1.267 af, Depth> 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
17,810	98	Water Surface, 0% imp, HSG C
261,360	68	1 acre lots, 20% imp, HSG B
444,760	55	Woods, Good, HSG B
723,930	61	Weighted Average
671,658		92.78% Pervious Area
52,272		7.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0200	0.76		**Sheet Flow, AB**
					Smooth surfaces n= 0.011 P2= 3.00"
9.4	94	0.0213	0.17		**Sheet Flow, BC**
					Grass: Short n= 0.150 P2= 3.00"
6.3	550	0.0836	1.45		**Shallow Concentrated Flow, CD**
					Woodland Kv= 5.0 fps
1.3	776	0.0657	9.69	58.13	**Channel Flow, DE**
					Area= 6.0 sf Perim= 9.0' r= 0.67'
					n= 0.030 Earth, clean & winding
17.1	1,426	Total			

Subcatchment 6S: Off-Site Drainage



Summary for Subcatchment 7S: Sub #7

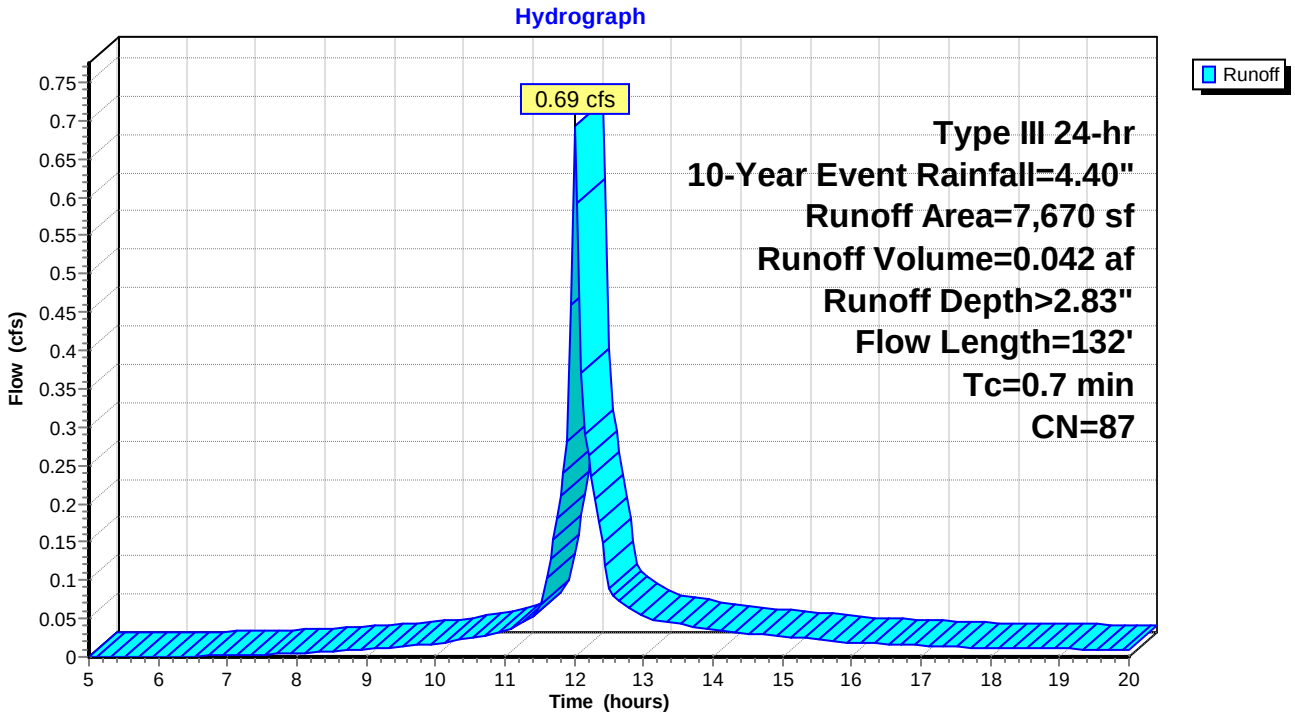
Runoff = 0.69 cfs @ 12.01 hrs, Volume= 0.042 af, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
4,280	98	Water Surface, HSG C
3,390	74	>75% Grass cover, Good, HSG C
7,670	87	Weighted Average
3,390		44.20% Pervious Area
4,280		55.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	39	0.0256	1.22		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.2	93	0.0753	9.10	36.41	**Channel Flow, BC** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.030 Earth, clean & winding
0.7	132	Total			

Subcatchment 7S: Sub #7



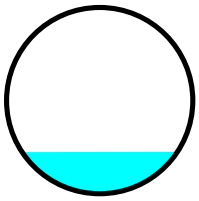
Summary for Reach 1R: New 18" PE Culvert

Inflow Area = 0.867 ac, 43.64% Impervious, Inflow Depth > 1.98" for 10-Year Event event
Inflow = 2.38 cfs @ 12.02 hrs, Volume= 0.143 af
Outflow = 2.33 cfs @ 12.03 hrs, Volume= 0.143 af, Atten= 2%, Lag= 0.6 min

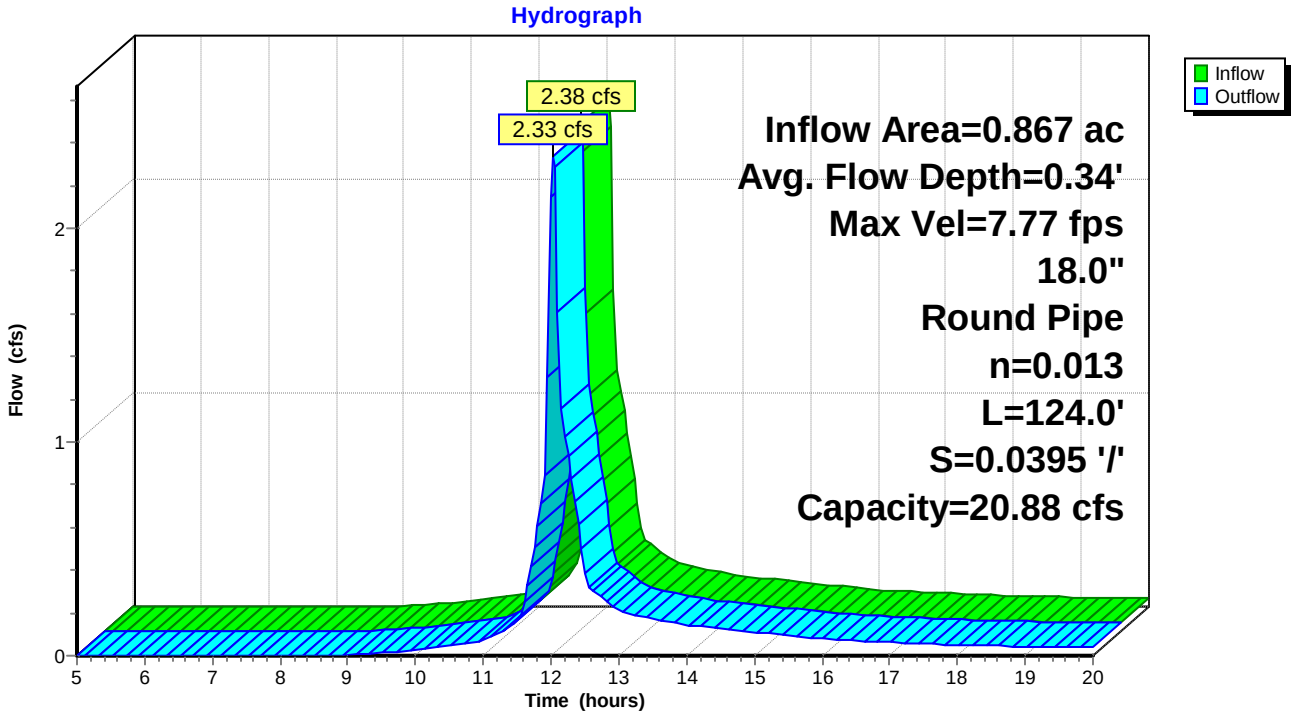
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.77 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.97 fps, Avg. Travel Time= 0.7 min

Peak Storage= 37 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 20.88 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 124.0' Slope= 0.0395 '/'
Inlet Invert= 96.00', Outlet Invert= 91.10'



Reach 1R: New 18" PE Culvert



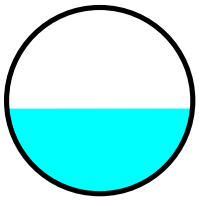
Summary for Reach 2R: New 18" PE Pipe

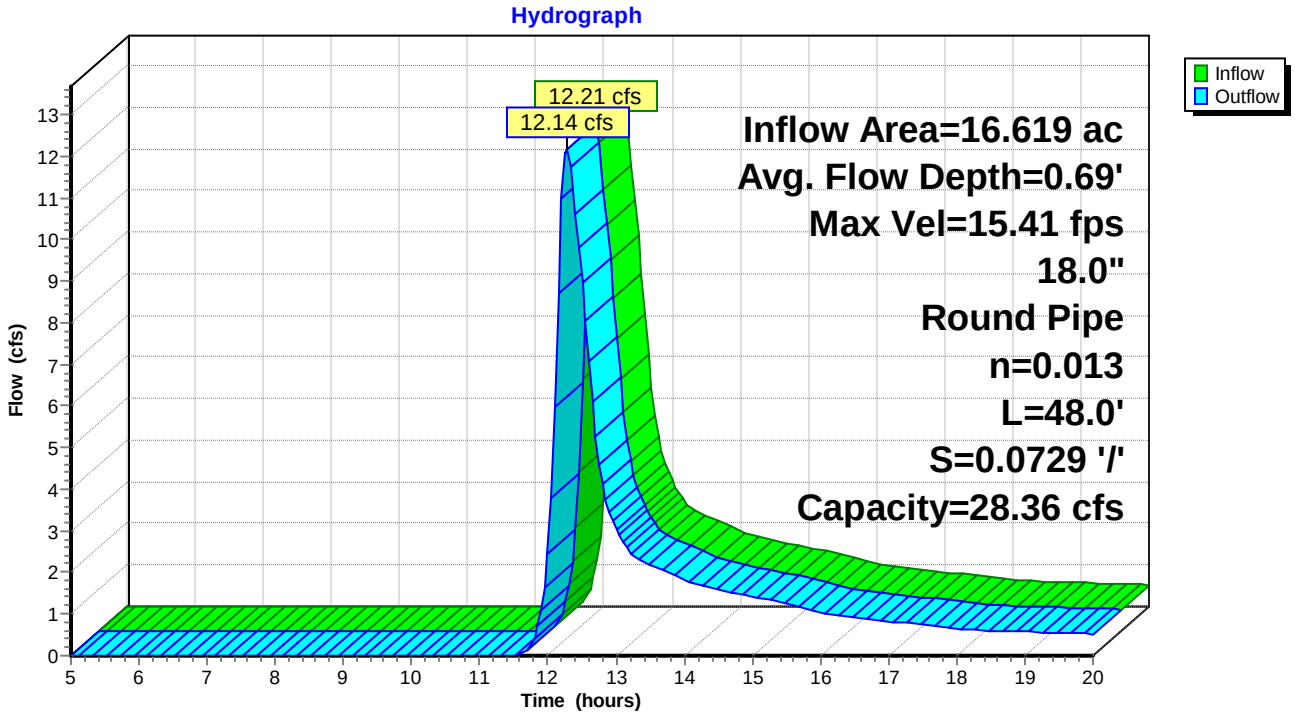
Inflow Area = 16.619 ac, 7.22% Impervious, Inflow Depth > 0.91" for 10-Year Event event
Inflow = 12.21 cfs @ 12.27 hrs, Volume= 1.267 af
Outflow = 12.14 cfs @ 12.28 hrs, Volume= 1.266 af, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 15.41 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 8.07 fps, Avg. Travel Time= 0.1 min

Peak Storage= 38 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.69'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 28.36 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 48.0' Slope= 0.0729 '/'
Inlet Invert= 111.50', Outlet Invert= 108.00'





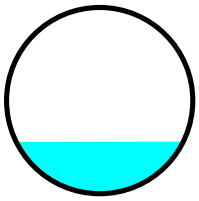
Summary for Reach 3R: 30" CI Pipe

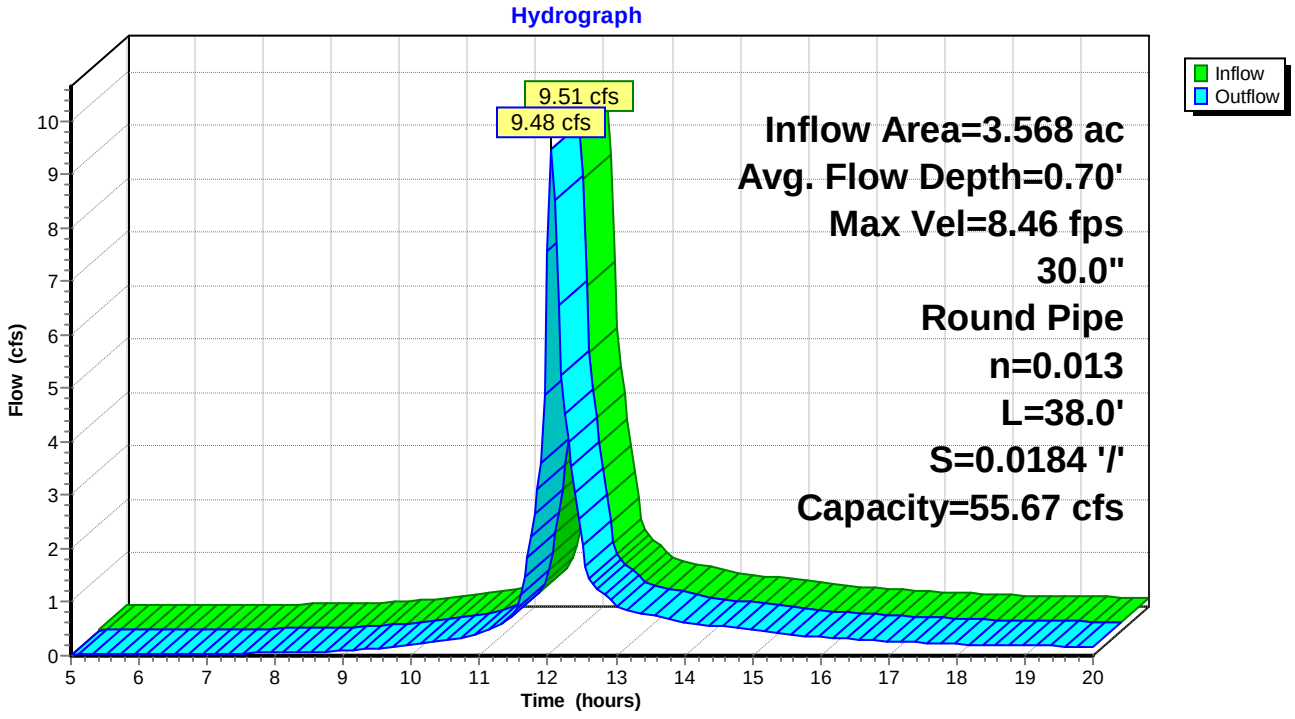
Inflow Area = 3.568 ac, 59.10% Impervious, Inflow Depth > 2.26" for 10-Year Event event
Inflow = 9.51 cfs @ 12.06 hrs, Volume= 0.671 af
Outflow = 9.48 cfs @ 12.06 hrs, Volume= 0.671 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.46 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.98 fps, Avg. Travel Time= 0.2 min

Peak Storage= 43 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 55.67 cfs

30.0" Round Pipe
n= 0.013 Cast iron, coated
Length= 38.0' Slope= 0.0184 '/'
Inlet Invert= 89.00', Outlet Invert= 88.30'



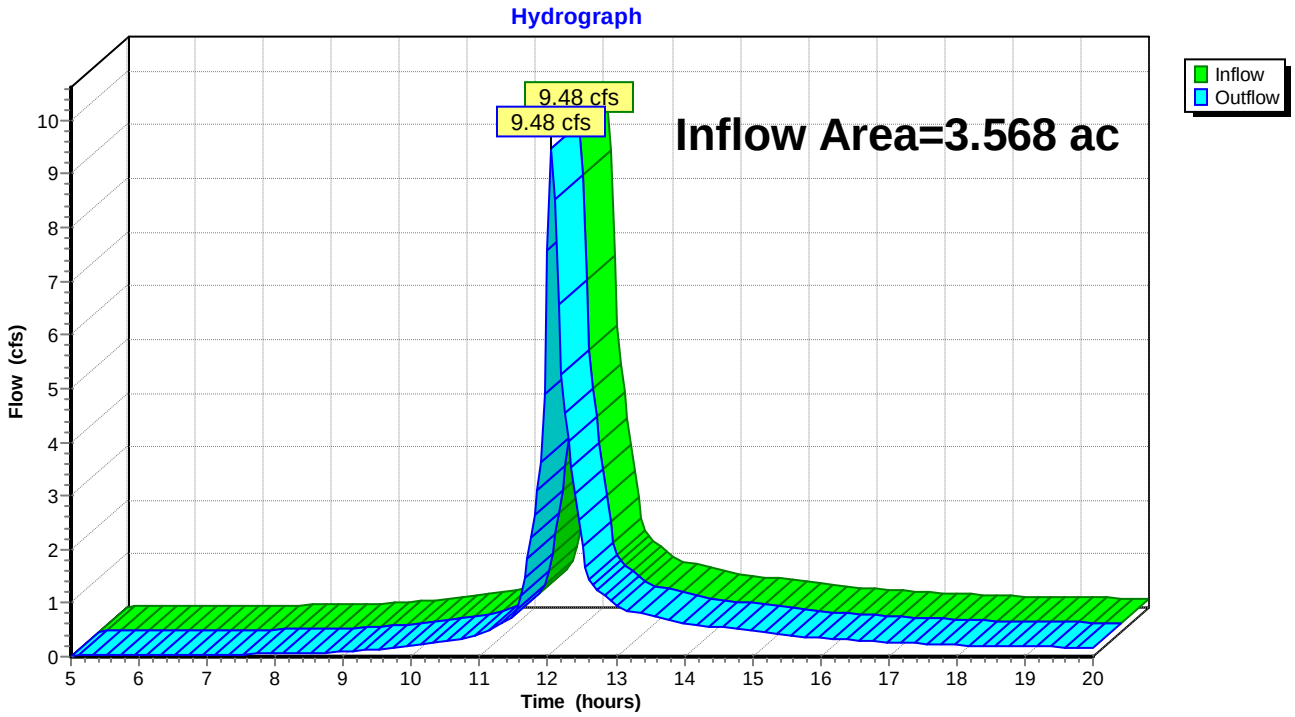


Summary for Reach SP1: Study Point 1

Inflow Area = 3.568 ac, 59.10% Impervious, Inflow Depth > 2.26" for 10-Year Event event
Inflow = 9.48 cfs @ 12.06 hrs, Volume= 0.671 af
Outflow = 9.48 cfs @ 12.06 hrs, Volume= 0.671 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP1: Study Point 1

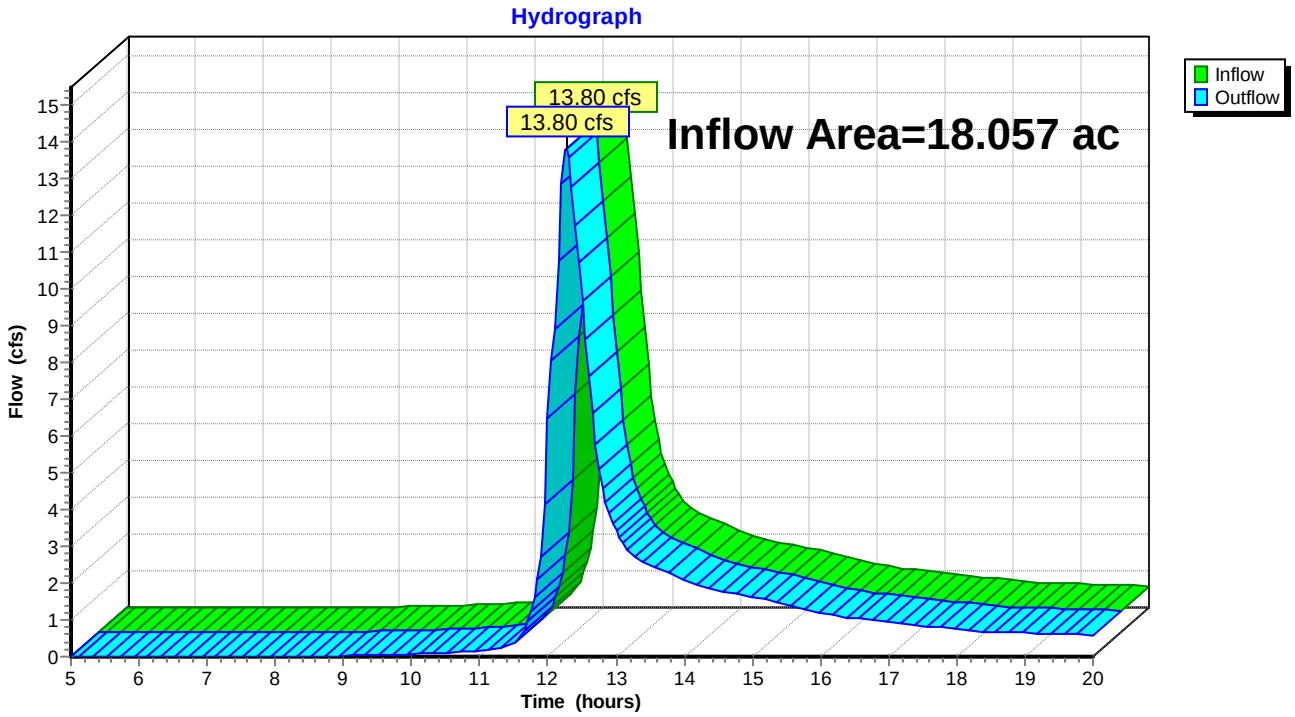


Summary for Reach SP2: Study Point 2

Inflow Area = 18.057 ac, 11.03% Impervious, Inflow Depth > 1.02" for 10-Year Event event
Inflow = 13.80 cfs @ 12.27 hrs, Volume= 1.533 af
Outflow = 13.80 cfs @ 12.27 hrs, Volume= 1.533 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP2: Study Point 2



Summary for Pond 1P: CB #1

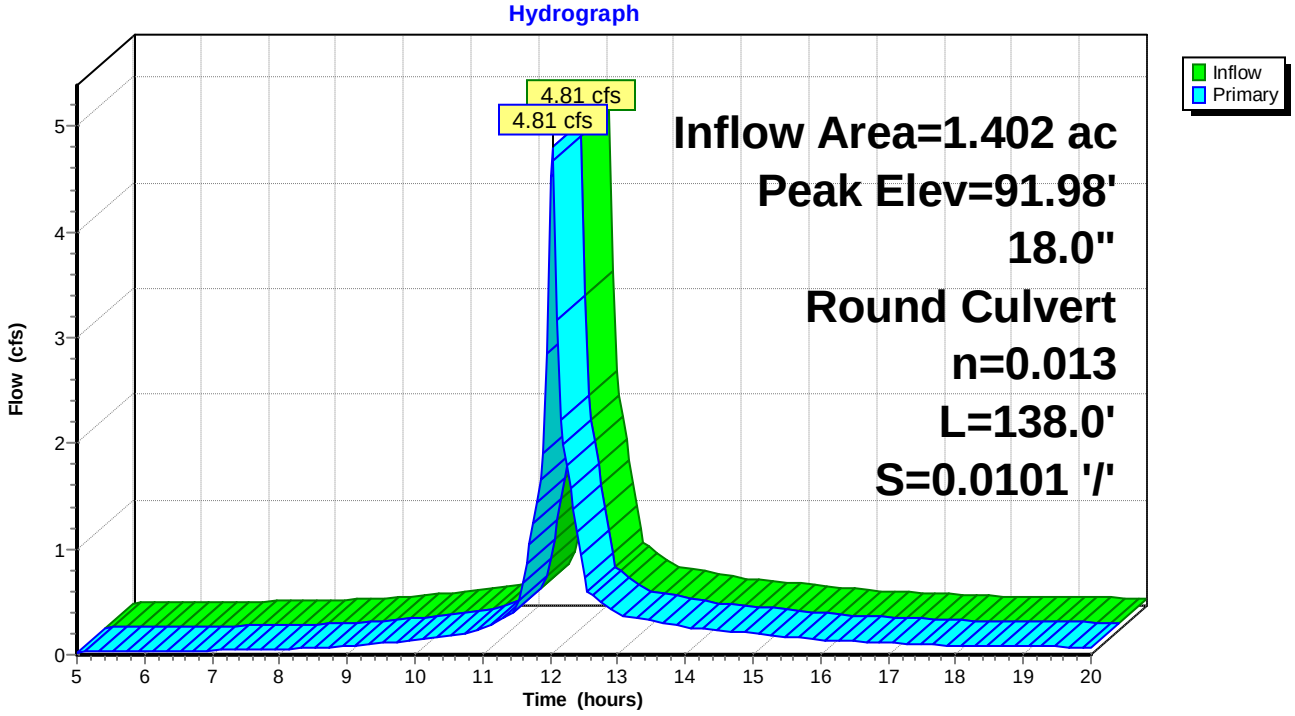
Inflow Area = 1.402 ac, 64.93% Impervious, Inflow Depth > 2.69" for 10-Year Event event
Inflow = 4.81 cfs @ 12.03 hrs, Volume= 0.314 af
Outflow = 4.81 cfs @ 12.03 hrs, Volume= 0.314 af, Atten= 0%, Lag= 0.0 min
Primary = 4.81 cfs @ 12.03 hrs, Volume= 0.314 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 91.98' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	90.90'	**18.0" Round Culvert** L= 138.0' Ke= 0.500 Inlet / Outlet Invert= 90.90' / 89.50' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=4.61 cfs @ 12.03 hrs HW=91.95' (Free Discharge)
1=Culvert (Inlet Controls 4.61 cfs @ 3.49 fps)

Pond 1P: CB #1



Summary for Pond 2P: Grease/Oil Separator

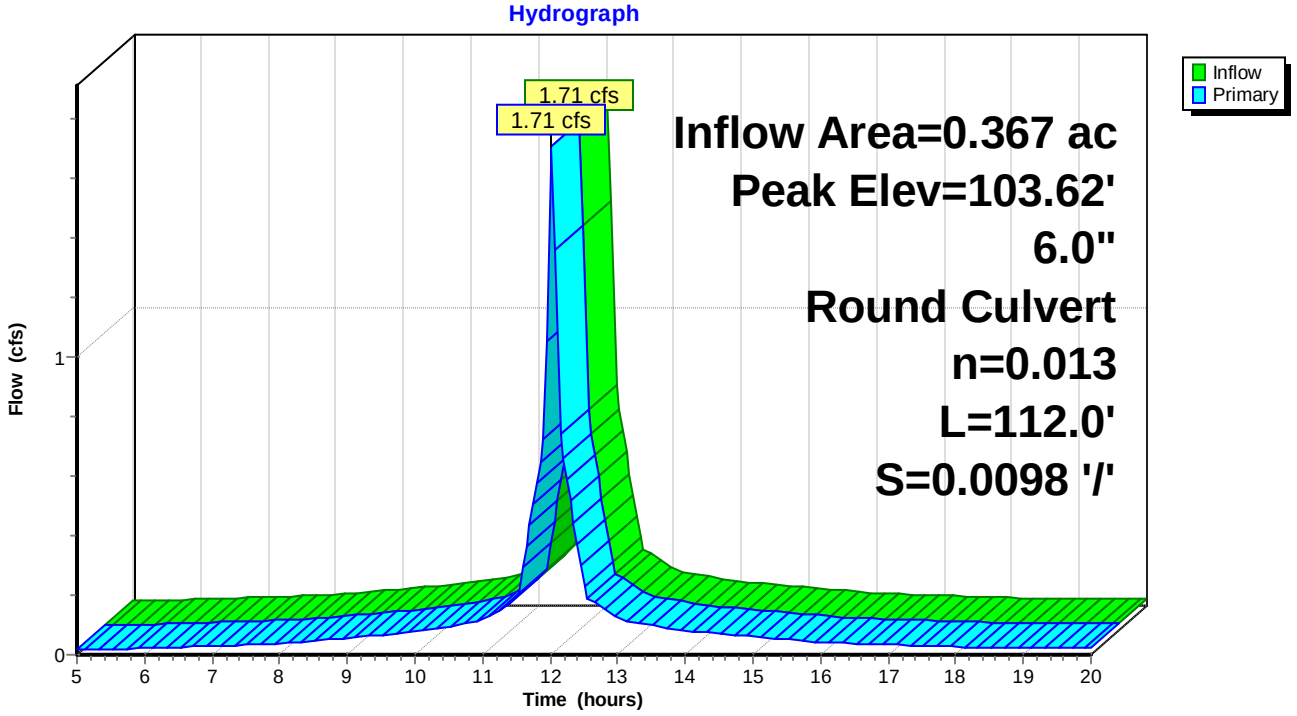
Inflow Area = 0.367 ac,100.00% Impervious, Inflow Depth > 3.87" for 10-Year Event event
Inflow = 1.71 cfs @ 12.03 hrs, Volume= 0.119 af
Outflow = 1.71 cfs @ 12.03 hrs, Volume= 0.119 af, Atten= 0%, Lag= 0.0 min
Primary = 1.71 cfs @ 12.03 hrs, Volume= 0.119 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 103.62' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	92.20'	**6.0" Round Culvert** L= 112.0' Ke= 0.500 Inlet / Outlet Invert= 92.20' / 91.10' S= 0.0098 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=1.64 cfs @ 12.03 hrs HW=102.80' (Free Discharge)
1=Culvert (Barrel Controls 1.64 cfs @ 8.34 fps)

Pond 2P: Grease/Oil Separator



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Sub #1 Runoff Area=16,000 sf 100.00% Impervious Runoff Depth>4.51"
Flow Length=105' Slope=0.0100 '/' Tc=1.7 min CN=98 Runoff=1.99 cfs 0.138 af

Subcatchment 2S: Sub #2 Runoff Area=7,290 sf 98.22% Impervious Runoff Depth>4.43"
Flow Length=135' Tc=1.5 min CN=97 Runoff=0.90 cfs 0.062 af

Subcatchment 3S: Sub #3 Runoff Area=94,385 sf 55.33% Impervious Runoff Depth>2.52"
Flow Length=489' Tc=5.7 min CN=77 Runoff=6.79 cfs 0.455 af

Subcatchment 4S: Sub #4 Runoff Area=54,965 sf 54.93% Impervious Runoff Depth>2.70"
Flow Length=283' Tc=1.9 min CN=79 Runoff=4.68 cfs 0.284 af

Subcatchment 5S: Sub #5 Runoff Area=37,760 sf 43.64% Impervious Runoff Depth>2.52"
Flow Length=422' Tc=1.2 min CN=77 Runoff=3.03 cfs 0.182 af

Subcatchment 6S: Off-Site Drainage Runoff Area=723,930 sf 7.22% Impervious Runoff Depth>1.29"
Flow Length=1,426' Tc=17.1 min CN=61 Runoff=18.10 cfs 1.784 af

Subcatchment 7S: Sub #7 Runoff Area=7,670 sf 55.80% Impervious Runoff Depth>3.46"
Flow Length=132' Tc=0.7 min CN=87 Runoff=0.84 cfs 0.051 af

Reach 1R: New 18" PE Culvert Avg. Flow Depth=0.39' Max Vel=8.32 fps Inflow=3.03 cfs 0.182 af
18.0" Round Pipe n=0.013 L=124.0' S=0.0395 '/' Capacity=20.88 cfs Outflow=2.97 cfs 0.182 af

Reach 2R: New 18" PE Pipe Avg. Flow Depth=0.87' Max Vel=17.00 fps Inflow=18.10 cfs 1.784 af
18.0" Round Pipe n=0.013 L=48.0' S=0.0729 '/' Capacity=28.36 cfs Outflow=18.09 cfs 1.784 af

Reach 3R: 30" CI Pipe Avg. Flow Depth=0.78' Max Vel=9.01 fps Inflow=11.88 cfs 0.837 af
30.0" Round Pipe n=0.013 L=38.0' S=0.0184 '/' Capacity=55.67 cfs Outflow=11.84 cfs 0.837 af

Reach SP1: Study Point 1 Inflow=11.84 cfs 0.837 af
Outflow=11.84 cfs 0.837 af

Reach SP2: Study Point 2 Inflow=20.11 cfs 2.119 af
Outflow=20.11 cfs 2.119 af

Pond 1P: CB #1 Peak Elev=92.13' Inflow=5.85 cfs 0.382 af
18.0" Round Culvert n=0.013 L=138.0' S=0.0101 '/' Outflow=5.85 cfs 0.382 af

Pond 2P: Grease/Oil Separator Peak Elev=107.81' Inflow=1.99 cfs 0.138 af
6.0" Round Culvert n=0.013 L=112.0' S=0.0098 '/' Outflow=1.99 cfs 0.138 af

Total Runoff Area = 21.625 ac Runoff Volume = 2.956 af Average Runoff Depth = 1.64"
81.04% Pervious = 17.525 ac 18.96% Impervious = 4.100 ac

Summary for Subcatchment 1S: Sub #1

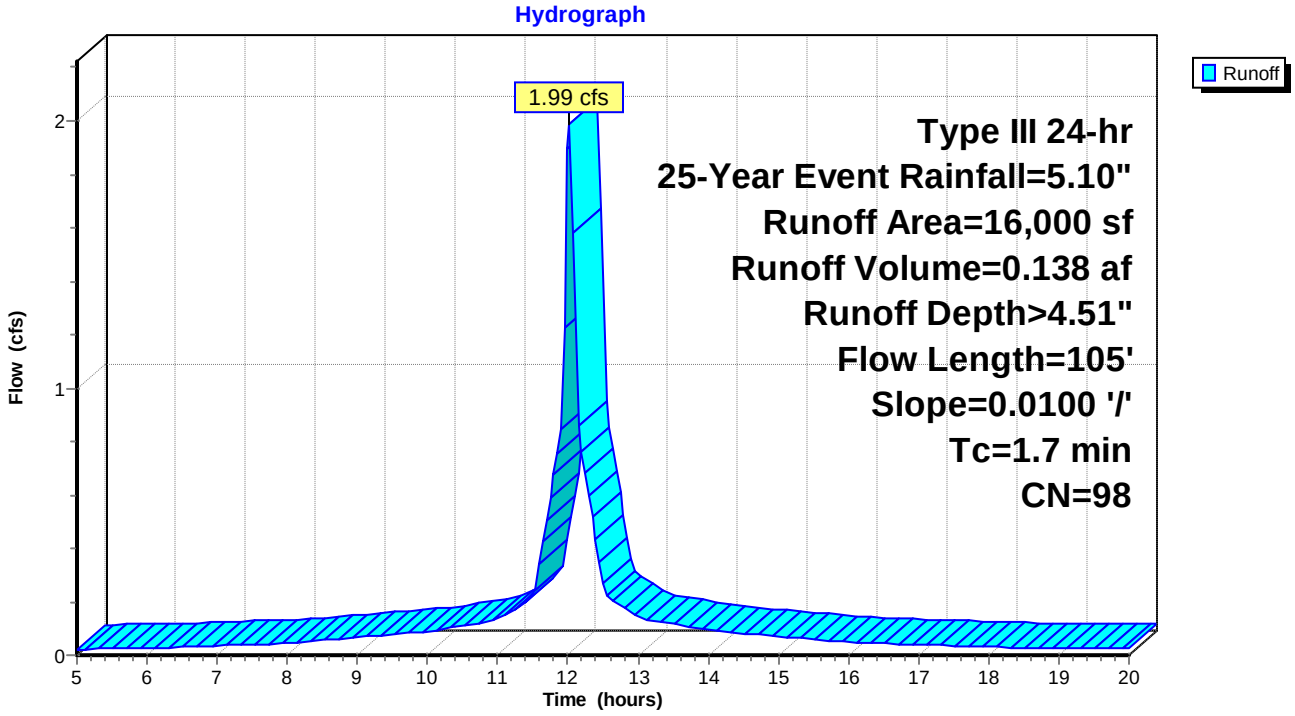
Runoff = 1.99 cfs @ 12.03 hrs, Volume= 0.138 af, Depth> 4.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
16,000	98	Water Surface, HSG C
16,000		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	105	0.0100	1.02		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"

Subcatchment 1S: Sub #1



Summary for Subcatchment 2S: Sub #2

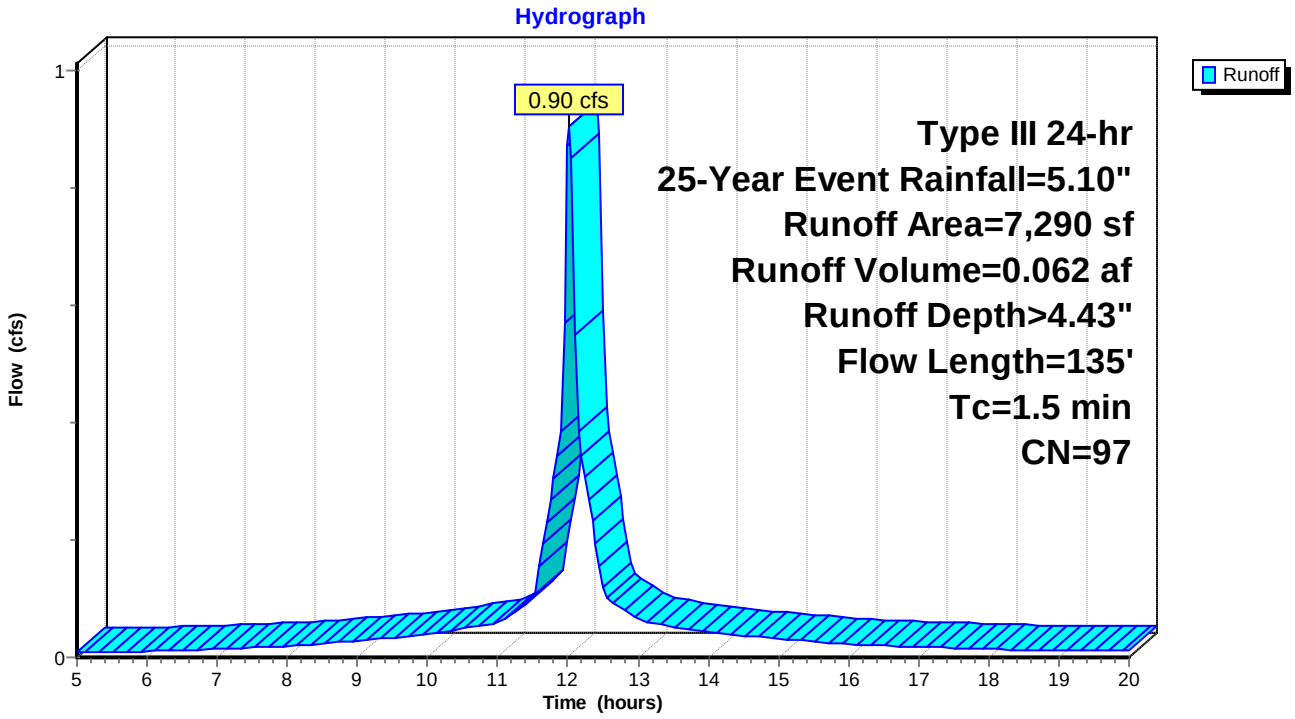
Runoff = 0.90 cfs @ 12.02 hrs, Volume= 0.062 af, Depth> 4.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
7,160	98	Water Surface, HSG C
130	39	>75% Grass cover, Good, HSG A
7,290	97	Weighted Average
130		1.78% Pervious Area
7,160		98.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0200	1.33		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.2	35	0.0257	3.25		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
1.5	135	Total			

Subcatchment 2S: Sub #2



Summary for Subcatchment 3S: Sub #3

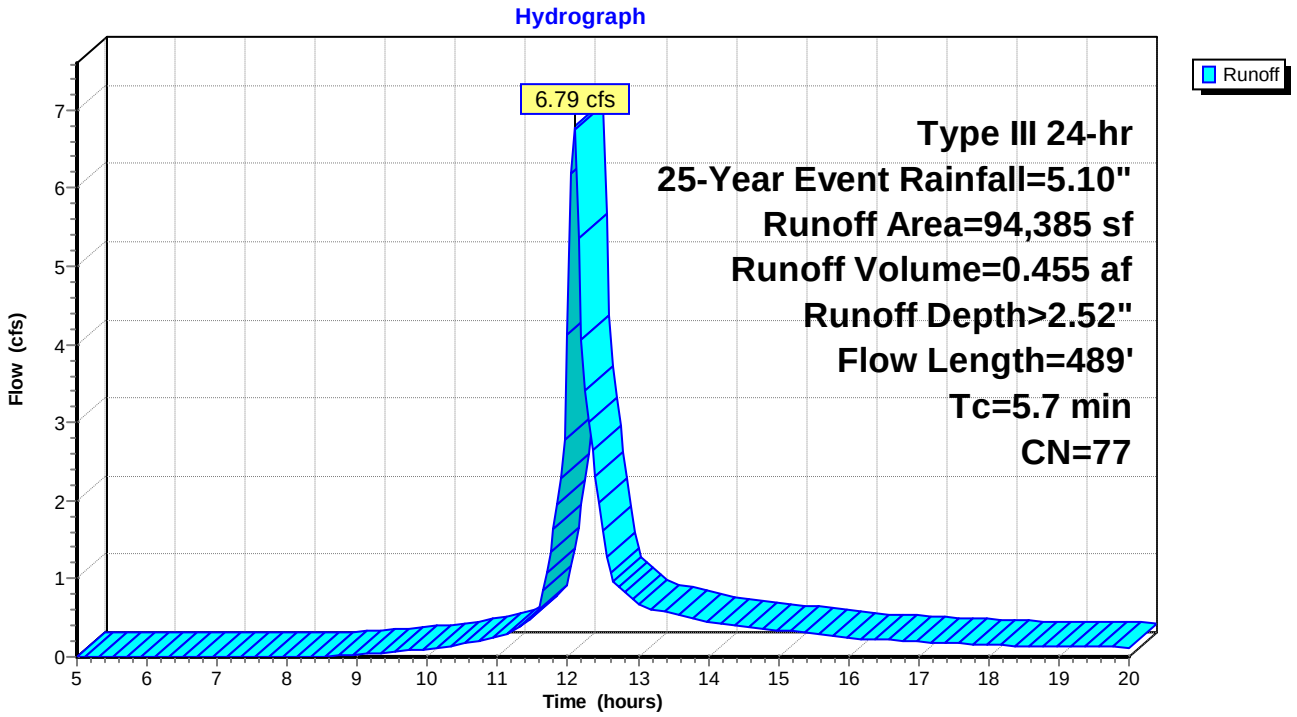
Runoff = 6.79 cfs @ 12.09 hrs, Volume= 0.455 af, Depth> 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
52,220	98	Water Surface, HSG C
19,795	39	>75% Grass cover, Good, HSG A
19,830	61	>75% Grass cover, Good, HSG B
2,540	74	>75% Grass cover, Good, HSG C
94,385	77	Weighted Average
42,165		44.67% Pervious Area
52,220		55.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	35	0.0400	0.18		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.00"
0.8	55	0.0200	1.18		**Sheet Flow, BC** Smooth surfaces n= 0.011 P2= 3.00"
0.1	45	0.3333	8.66		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
0.7	169	0.0100	3.98	15.92	**Channel Flow, DE** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.025 Earth, clean & straight
0.5	76	0.0132	2.33		**Shallow Concentrated Flow, EF** Paved Kv= 20.3 fps
0.1	36	0.1389	5.59		**Shallow Concentrated Flow, FG** Grassed Waterway Kv= 15.0 fps
0.2	73	0.0274	6.59	26.35	**Channel Flow, GH** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.025 Earth, clean & straight
5.7	489	Total			

Subcatchment 3S: Sub #3



Summary for Subcatchment 4S: Sub #4

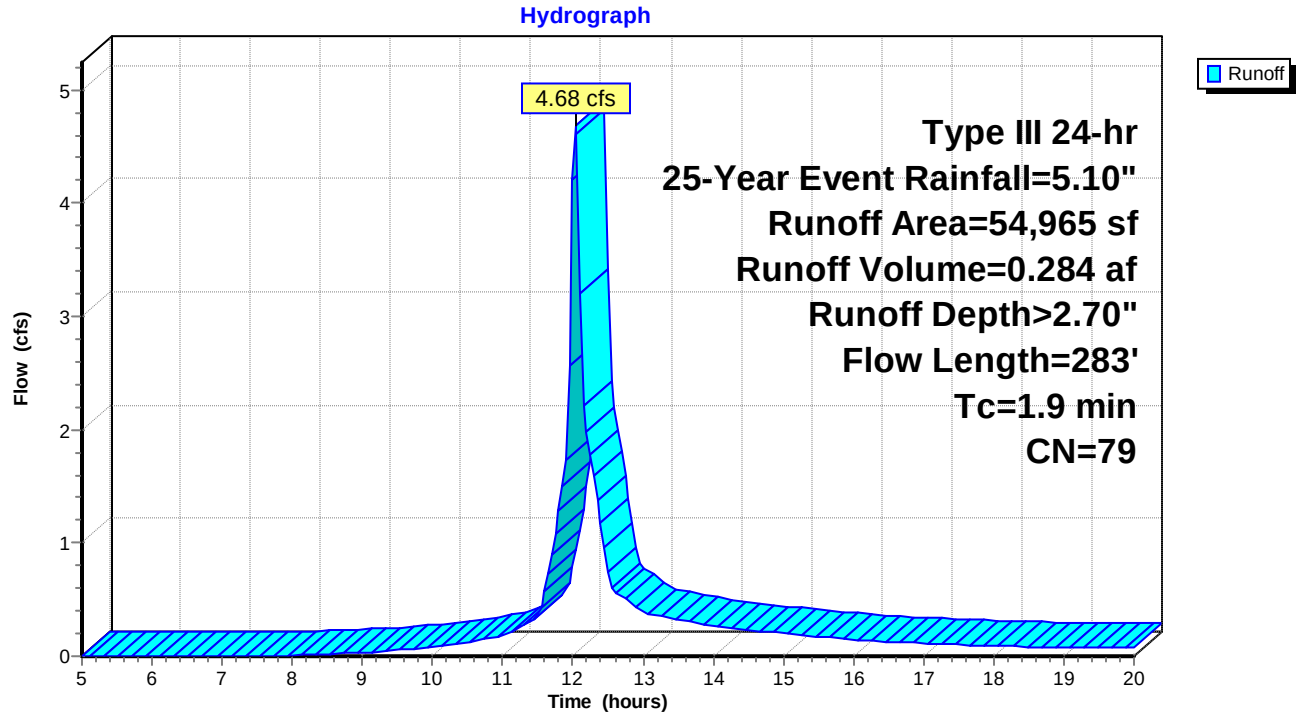
Runoff = 4.68 cfs @ 12.04 hrs, Volume= 0.284 af, Depth> 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
30,190	98	Water Surface, HSG C
12,440	39	>75% Grass cover, Good, HSG A
12,335	74	>75% Grass cover, Good, HSG C
54,965	79	Weighted Average
24,775		45.07% Pervious Area
30,190		54.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0180	1.28		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.2	36	0.0200	2.87		**Shallow Concentrated Flow, BC** Paved Kv= 20.3 fps
0.4	147	0.0259	6.41	25.62	**Channel Flow, CD** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.025 Earth, clean & straight
1.9	283	Total			

Subcatchment 4S: Sub #4



Summary for Subcatchment 5S: Sub #5

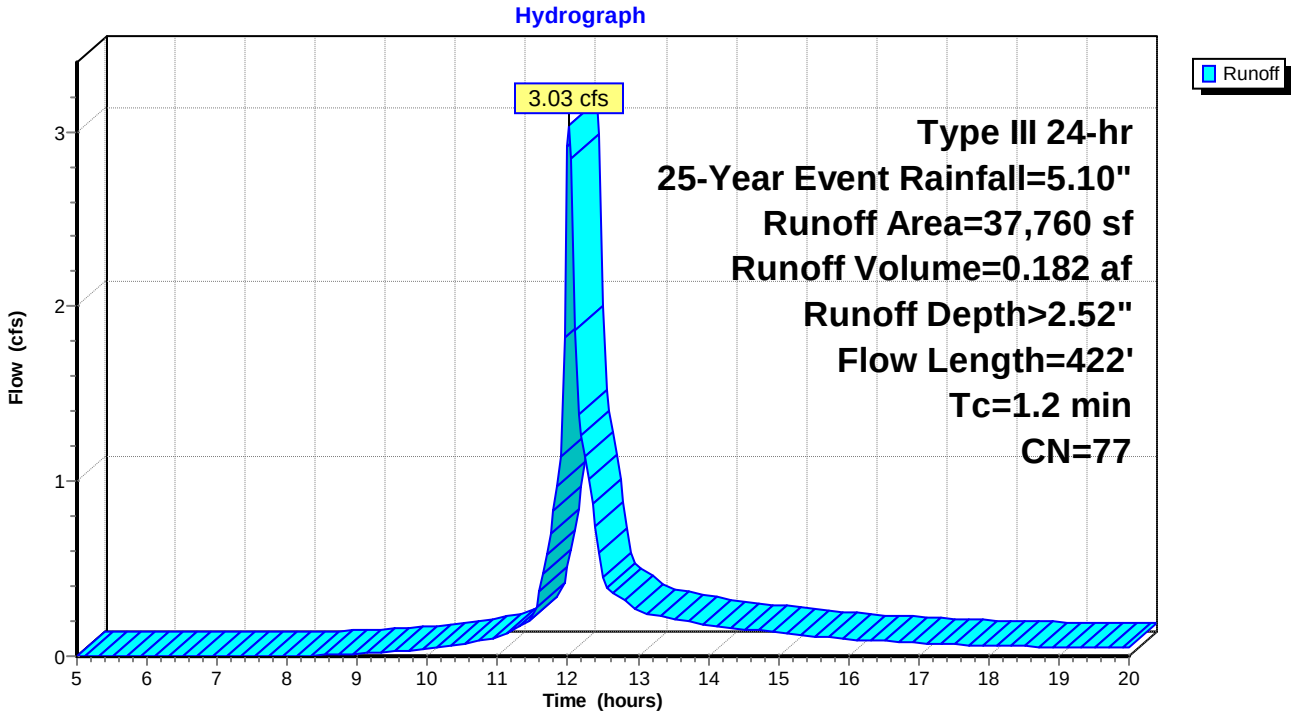
Runoff = 3.03 cfs @ 12.02 hrs, Volume= 0.182 af, Depth> 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
16,480	98	Water Surface, HSG C
7,625	39	>75% Grass cover, Good, HSG A
13,655	74	>75% Grass cover, Good, HSG C
37,760	77	Weighted Average
21,280		56.36% Pervious Area
16,480		43.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	35	0.0500	1.56		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.8	387	0.0449	8.43	33.74	**Channel Flow, BC** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.025 Earth, clean & straight
1.2	422	Total			

Subcatchment 5S: Sub #5



Summary for Subcatchment 6S: Off-Site Drainage

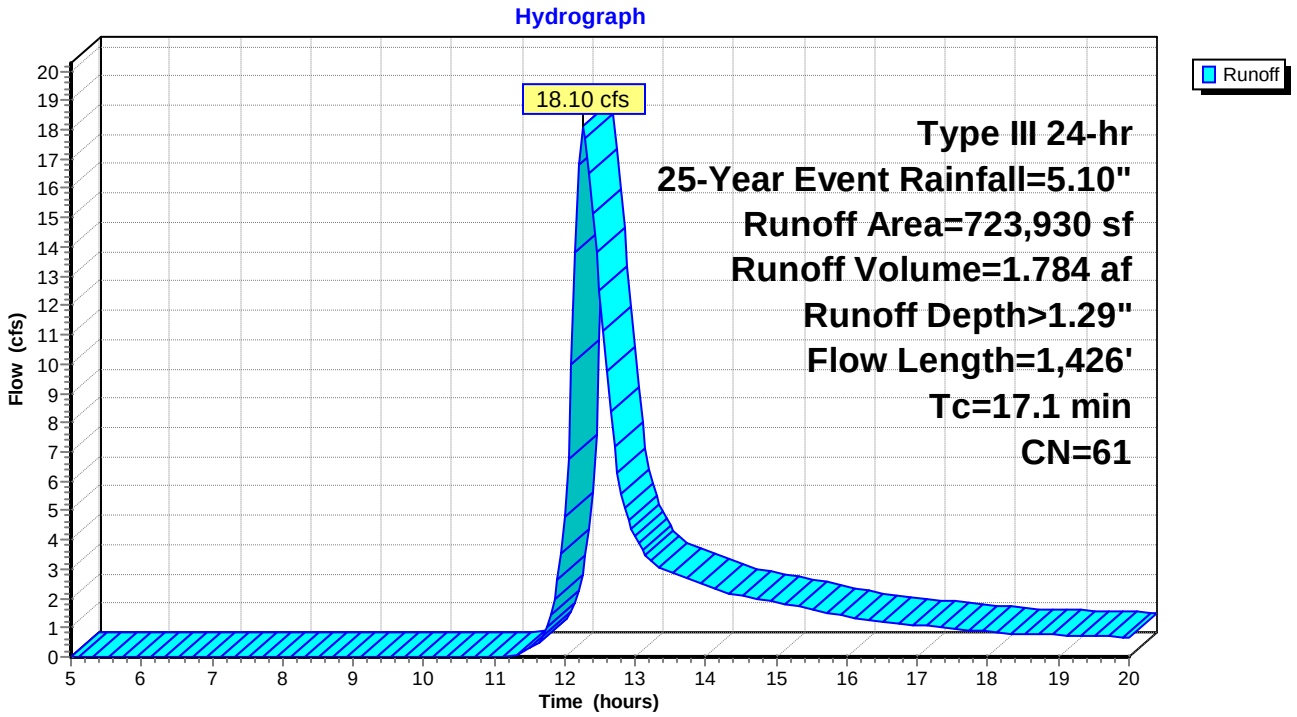
Runoff = 18.10 cfs @ 12.26 hrs, Volume= 1.784 af, Depth> 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
17,810	98	Water Surface, 0% imp, HSG C
261,360	68	1 acre lots, 20% imp, HSG B
444,760	55	Woods, Good, HSG B
723,930	61	Weighted Average
671,658		92.78% Pervious Area
52,272		7.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0200	0.76		**Sheet Flow, AB**
					Smooth surfaces n= 0.011 P2= 3.00"
9.4	94	0.0213	0.17		**Sheet Flow, BC**
					Grass: Short n= 0.150 P2= 3.00"
6.3	550	0.0836	1.45		**Shallow Concentrated Flow, CD**
					Woodland Kv= 5.0 fps
1.3	776	0.0657	9.69	58.13	**Channel Flow, DE**
					Area= 6.0 sf Perim= 9.0' r= 0.67'
					n= 0.030 Earth, clean & winding
17.1	1,426	Total			

Subcatchment 6S: Off-Site Drainage



Summary for Subcatchment 7S: Sub #7

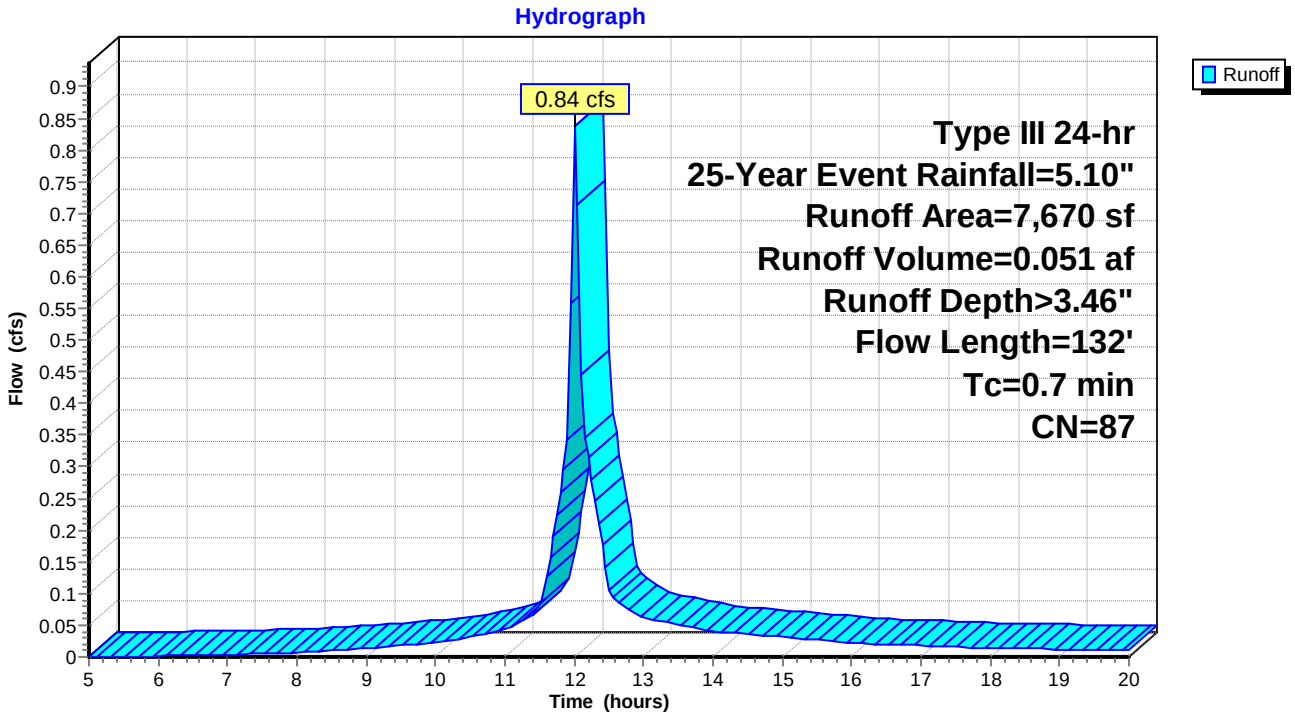
Runoff = 0.84 cfs @ 12.01 hrs, Volume= 0.051 af, Depth> 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
4,280	98	Water Surface, HSG C
3,390	74	>75% Grass cover, Good, HSG C
7,670	87	Weighted Average
3,390		44.20% Pervious Area
4,280		55.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	39	0.0256	1.22		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.2	93	0.0753	9.10	36.41	**Channel Flow, BC** Area= 4.0 sf Perim= 7.3' r= 0.55' n= 0.030 Earth, clean & winding
0.7	132	Total			

Subcatchment 7S: Sub #7



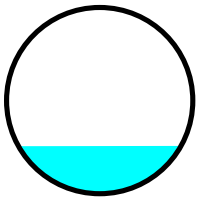
Summary for Reach 1R: New 18" PE Culvert

Inflow Area = 0.867 ac, 43.64% Impervious, Inflow Depth > 2.52" for 25-Year Event event
Inflow = 3.03 cfs @ 12.02 hrs, Volume= 0.182 af
Outflow = 2.97 cfs @ 12.03 hrs, Volume= 0.182 af, Atten= 2%, Lag= 0.6 min

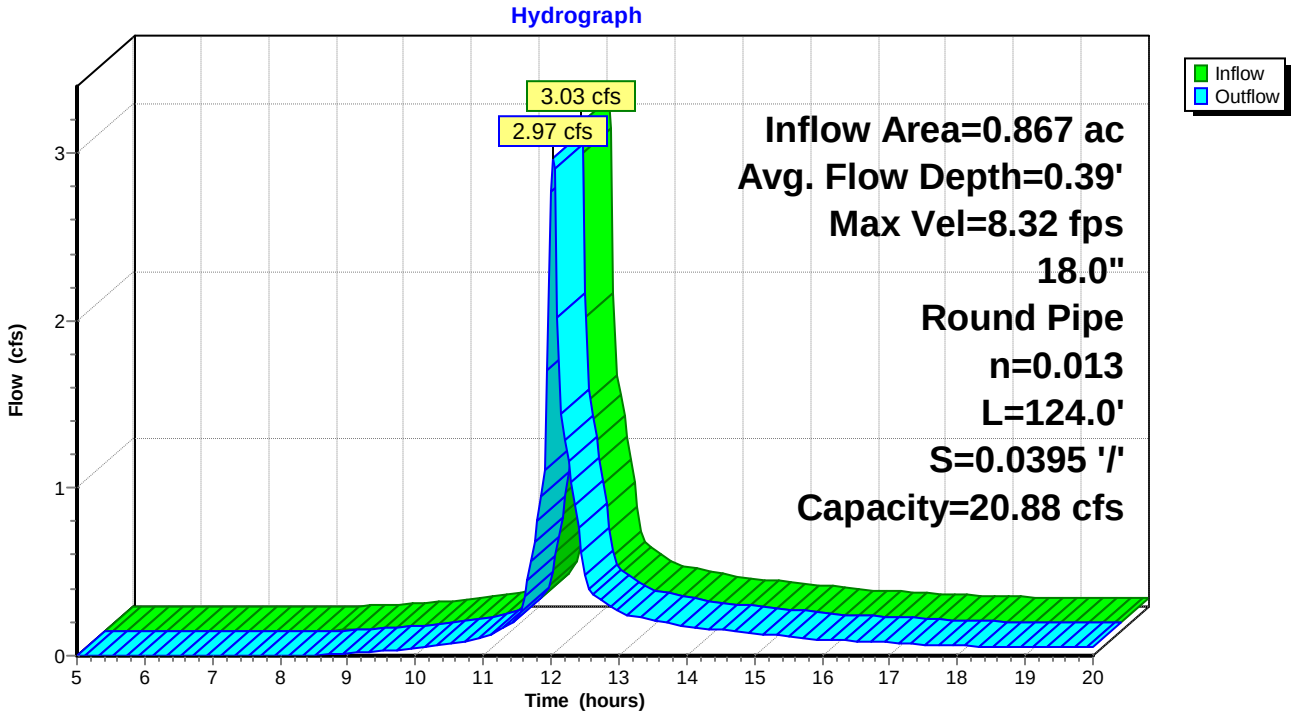
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.32 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.12 fps, Avg. Travel Time= 0.7 min

Peak Storage= 45 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 20.88 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 124.0' Slope= 0.0395 '/'
Inlet Invert= 96.00', Outlet Invert= 91.10'



Reach 1R: New 18" PE Culvert



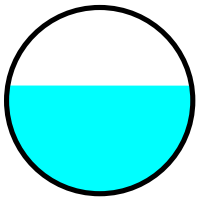
Summary for Reach 2R: New 18" PE Pipe

Inflow Area = 16.619 ac, 7.22% Impervious, Inflow Depth > 1.29" for 25-Year Event event
Inflow = 18.10 cfs @ 12.26 hrs, Volume= 1.784 af
Outflow = 18.09 cfs @ 12.27 hrs, Volume= 1.784 af, Atten= 0%, Lag= 0.1 min

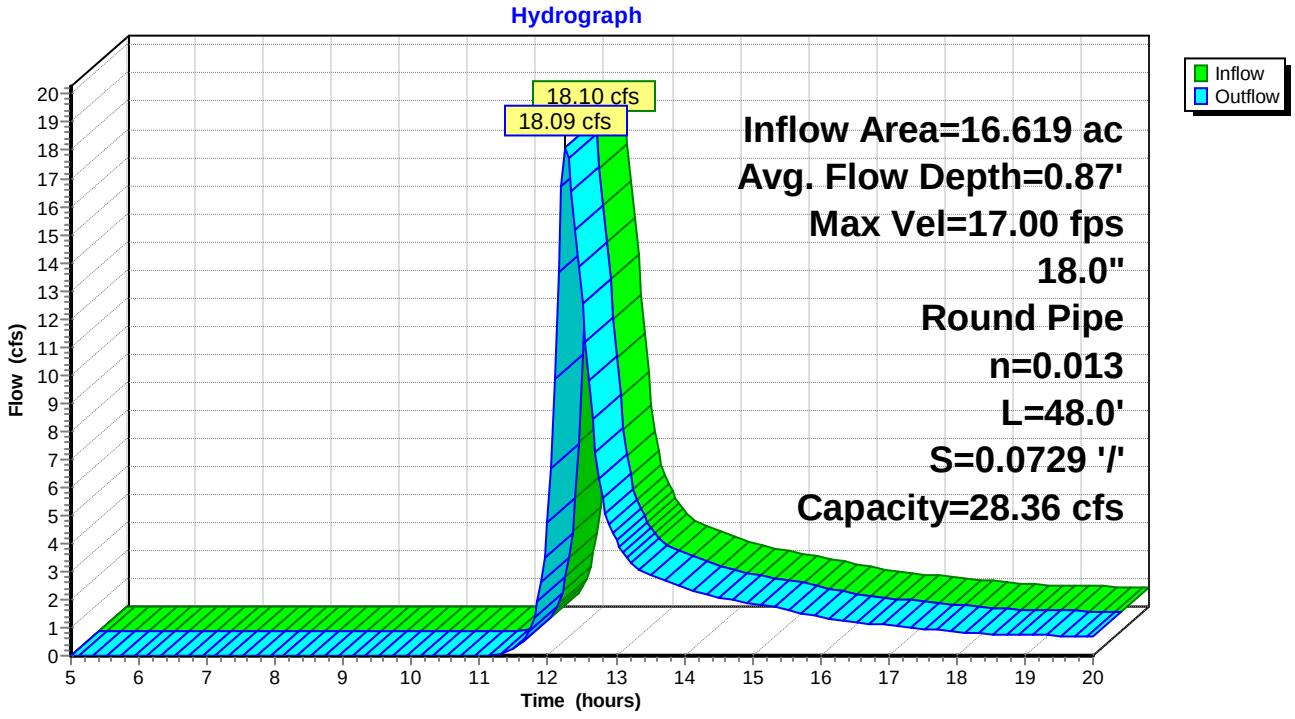
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 17.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 8.67 fps, Avg. Travel Time= 0.1 min

Peak Storage= 51 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.87'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 28.36 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 48.0' Slope= 0.0729 '/'
Inlet Invert= 111.50', Outlet Invert= 108.00'



Reach 2R: New 18" PE Pipe



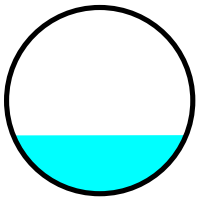
Summary for Reach 3R: 30" CI Pipe

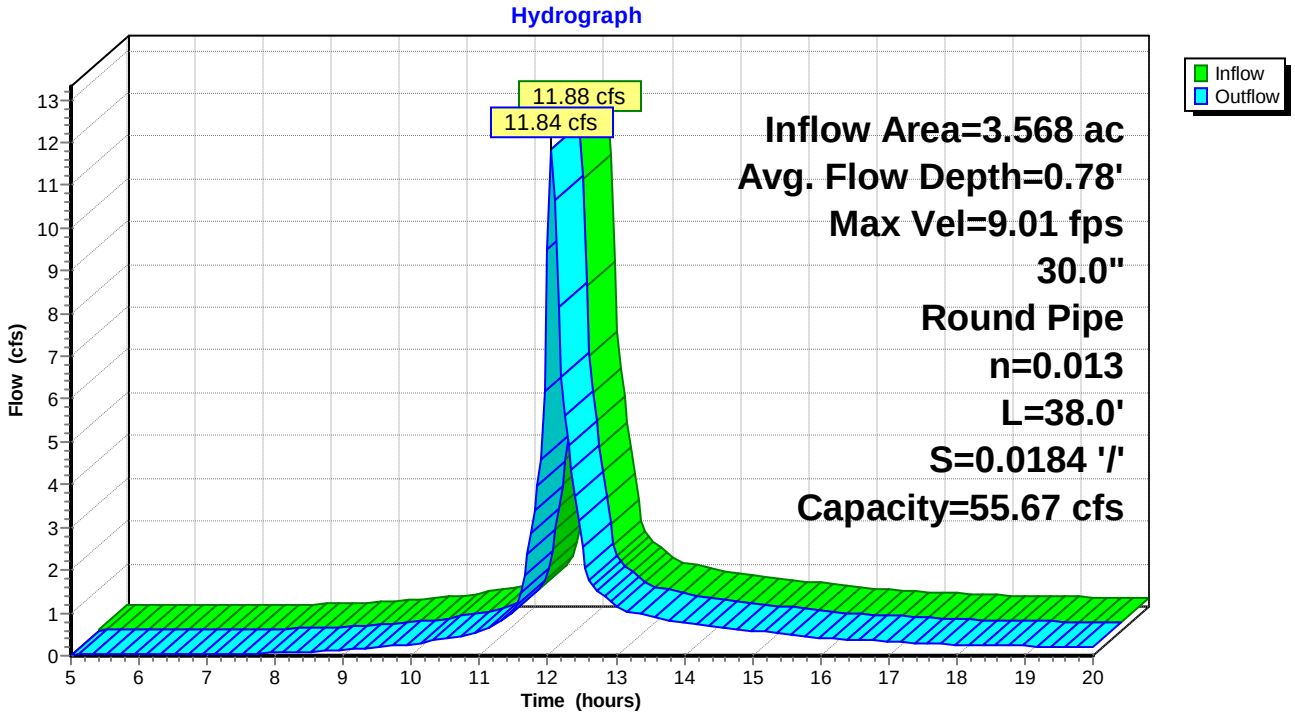
Inflow Area = 3.568 ac, 59.10% Impervious, Inflow Depth > 2.82" for 25-Year Event event
Inflow = 11.88 cfs @ 12.06 hrs, Volume= 0.837 af
Outflow = 11.84 cfs @ 12.06 hrs, Volume= 0.837 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.01 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.19 fps, Avg. Travel Time= 0.2 min

Peak Storage= 50 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.78'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 55.67 cfs

30.0" Round Pipe
n= 0.013 Cast iron, coated
Length= 38.0' Slope= 0.0184 '/'
Inlet Invert= 89.00', Outlet Invert= 88.30'



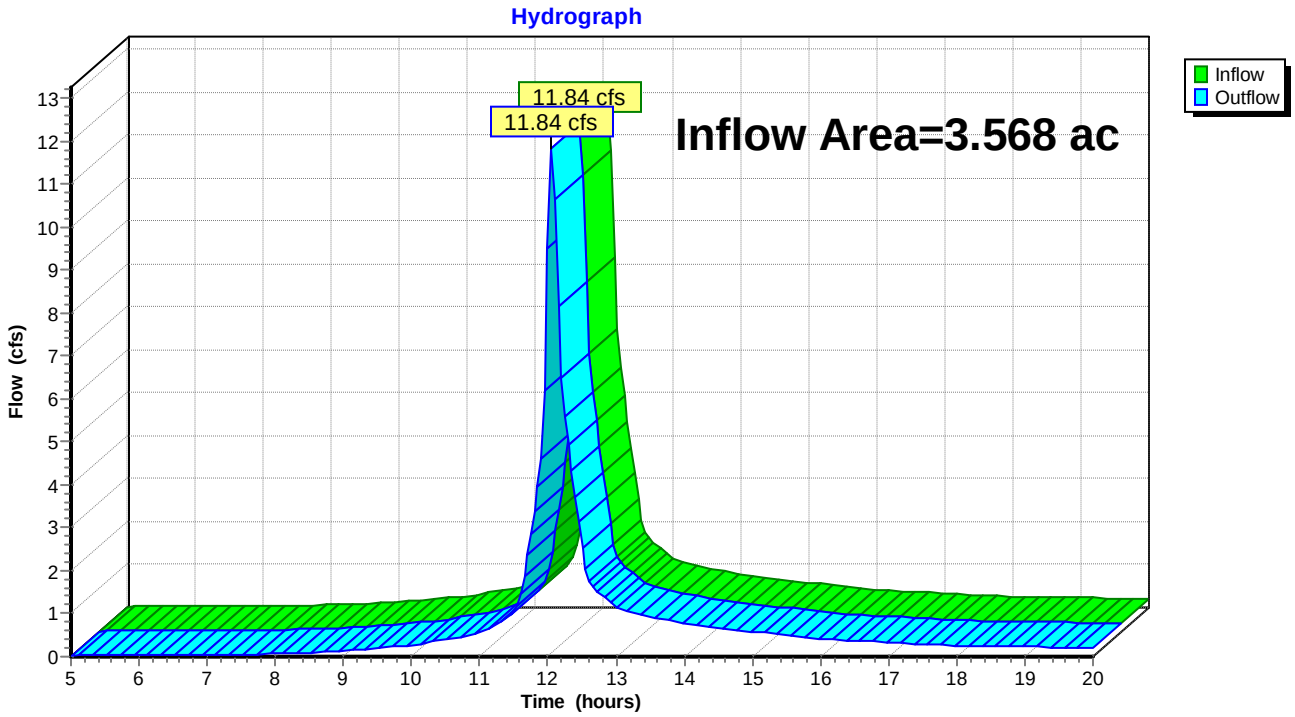


Summary for Reach SP1: Study Point 1

Inflow Area = 3.568 ac, 59.10% Impervious, Inflow Depth > 2.81" for 25-Year Event event
Inflow = 11.84 cfs @ 12.06 hrs, Volume= 0.837 af
Outflow = 11.84 cfs @ 12.06 hrs, Volume= 0.837 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP1: Study Point 1

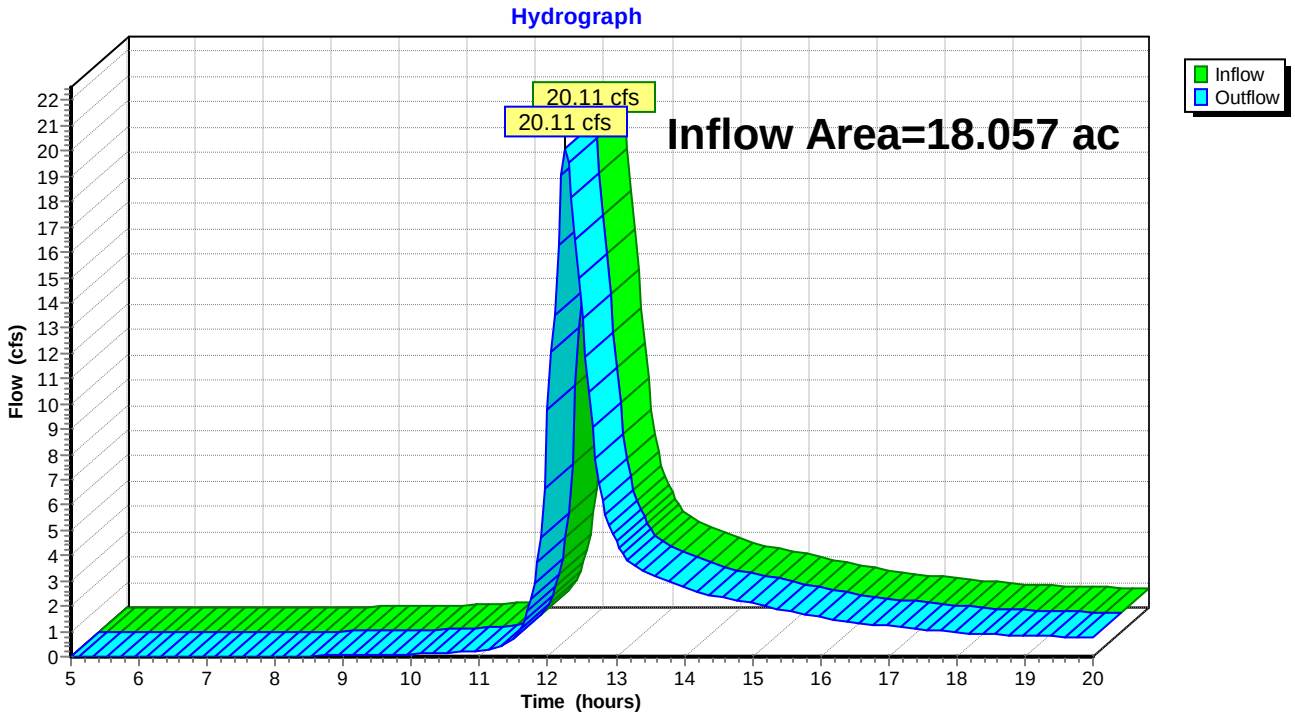


Summary for Reach SP2: Study Point 2

Inflow Area = 18.057 ac, 11.03% Impervious, Inflow Depth > 1.41" for 25-Year Event event
Inflow = 20.11 cfs @ 12.26 hrs, Volume= 2.119 af
Outflow = 20.11 cfs @ 12.26 hrs, Volume= 2.119 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP2: Study Point 2



Summary for Pond 1P: CB #1

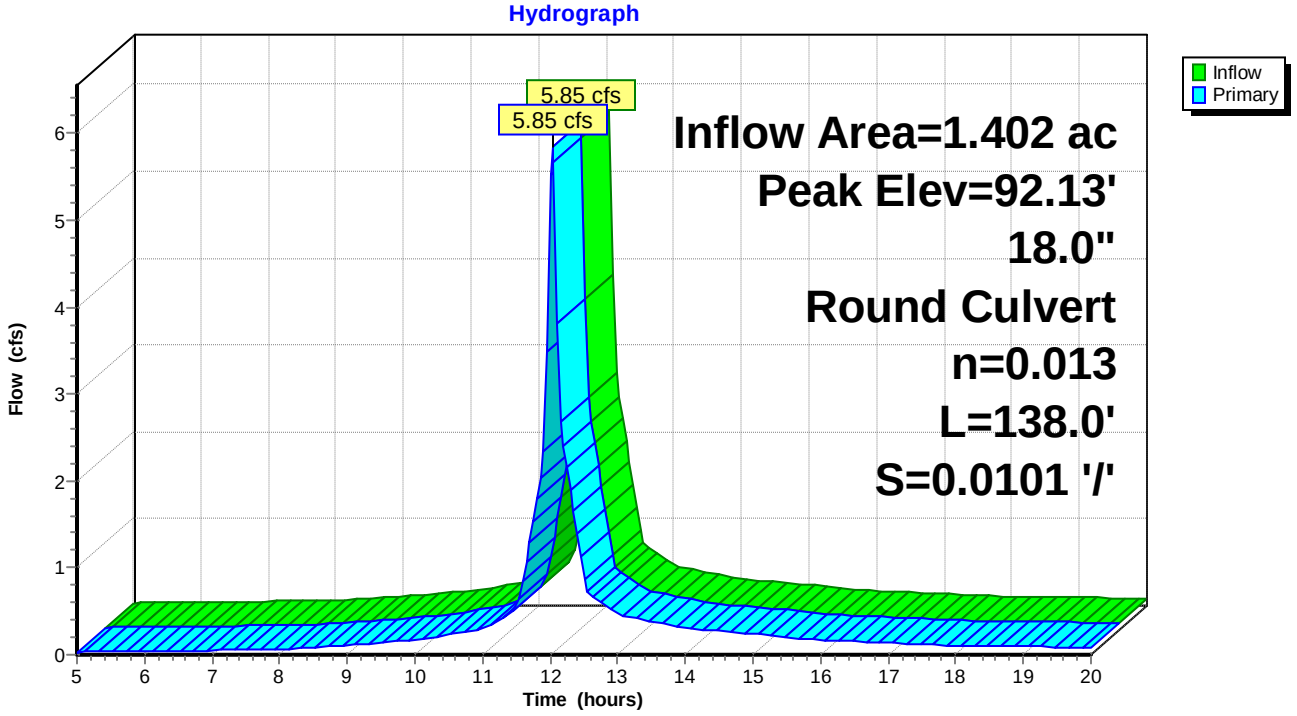
Inflow Area = 1.402 ac, 64.93% Impervious, Inflow Depth > 3.27" for 25-Year Event event
Inflow = 5.85 cfs @ 12.03 hrs, Volume= 0.382 af
Outflow = 5.85 cfs @ 12.03 hrs, Volume= 0.382 af, Atten= 0%, Lag= 0.0 min
Primary = 5.85 cfs @ 12.03 hrs, Volume= 0.382 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 92.13' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	90.90'	**18.0" Round Culvert** L= 138.0' Ke= 0.500 Inlet / Outlet Invert= 90.90' / 89.50' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=5.61 cfs @ 12.03 hrs HW=92.09' (Free Discharge)
1=Culvert (Inlet Controls 5.61 cfs @ 3.72 fps)

Pond 1P: CB #1



Summary for Pond 2P: Grease/Oil Separator

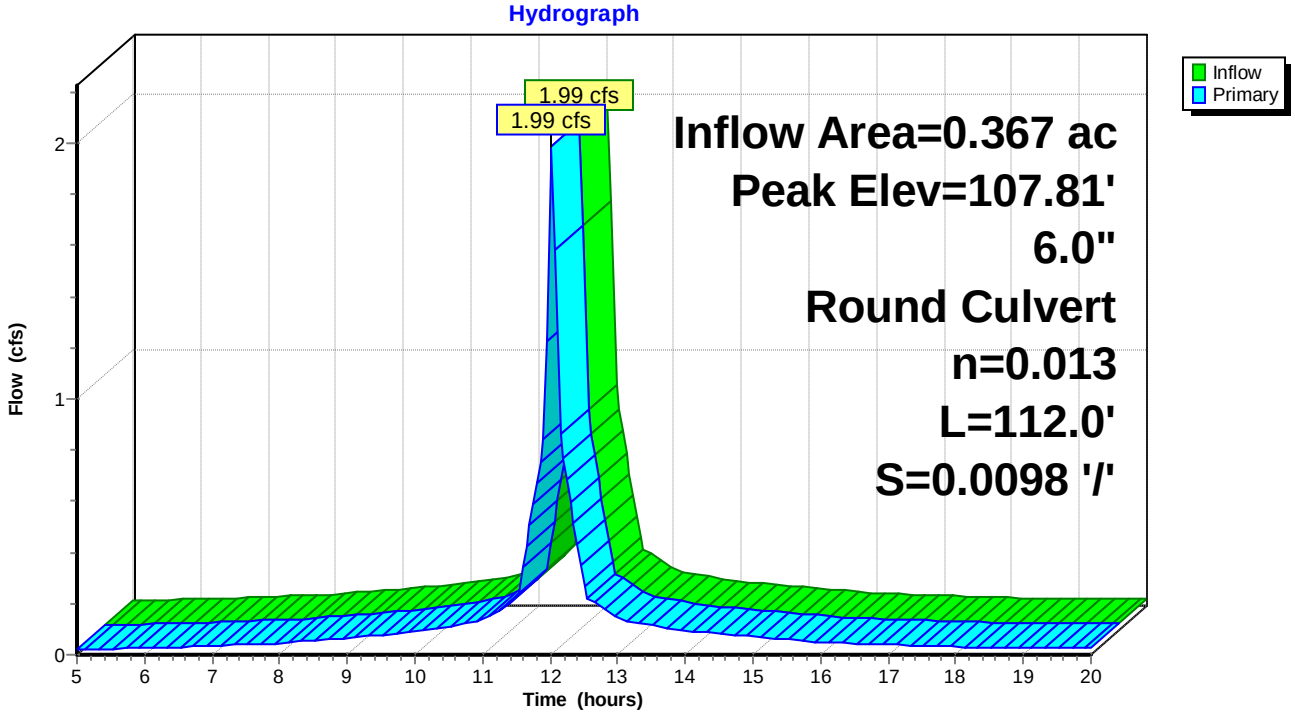
Inflow Area = 0.367 ac,100.00% Impervious, Inflow Depth > 4.51" for 25-Year Event event
Inflow = 1.99 cfs @ 12.03 hrs, Volume= 0.138 af
Outflow = 1.99 cfs @ 12.03 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min
Primary = 1.99 cfs @ 12.03 hrs, Volume= 0.138 af

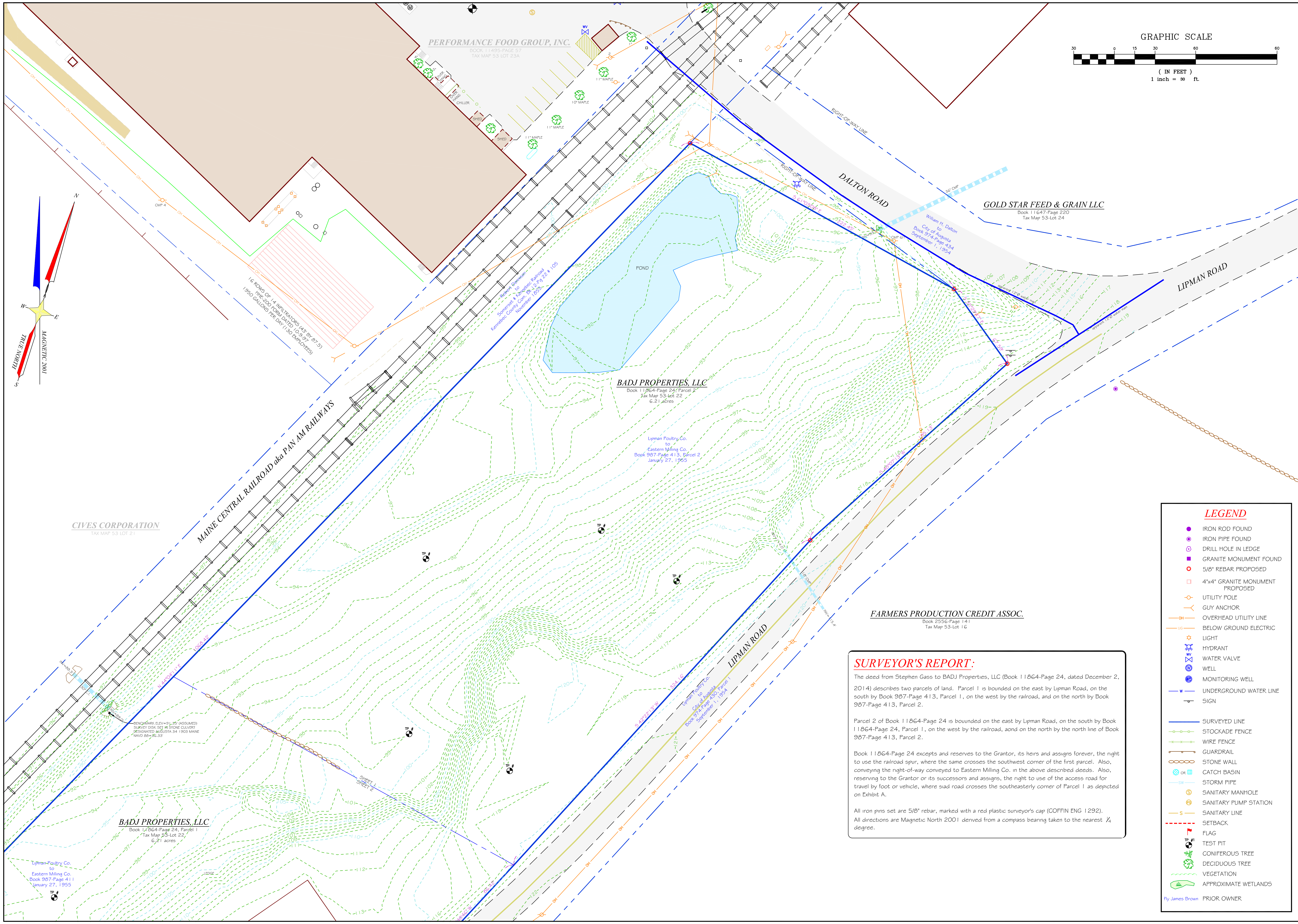
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 107.81' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	92.20'	**6.0" Round Culvert** L= 112.0' Ke= 0.500 Inlet / Outlet Invert= 92.20' / 91.10' S= 0.0098 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=1.90 cfs @ 12.03 hrs HW=106.70' (Free Discharge)
1=Culvert (Barrel Controls 1.90 cfs @ 9.69 fps)

Pond 2P: Grease/Oil Separator





SURVEYOR'S REPORT:

The deed from Stephen Gass to BADJ Properties, LLC (Book 11864-Page 24, dated December 2, 2014) describes two parcels of land. Parcel 1 is bounded on the east by Lipman Road, on the south by Book 987-Page 413, Parcel 1, on the west by the railroad, and on the north by Book 987-Page 413, Parcel 2.

Parcel 2 of Book 11864-Page 24 is bouunded on the east by Lipman Road, on the south by Book 11864-Page 24, Parcel 1, on the west by the railroad, aond on the north by the north line of Book 987-Page 413, Parcel 2.

Book 11864-Page 24 excepts and reserves to the Grantor, its heirs and assigns forever, the right to use the railroad spur, where the same crosses the southwest corner of the first parcel. Also, conveying the right-of-way conveyed to Eastern Milling Co. in the above described deeds. Also, reserving to the Grantor or its successors and assigns, the right to use of the access road for travel by foot or vehicle, where siad road crosses the southeasterly corner of Parcel 1 as depicted on Exhibit A.

All iron pins set are 5/8" rebar, marked with a red plastic surveyor's cap (COFFIN ENG 1292).
All directions are Magnetic North 2001 derived from a compass bearing taken to the nearest ¼ degree.

LEGEND

- IRON ROD FOUND
- IRON PIPE FOUND
- DRILL HOLE IN LEDGE
- GRANITE MONUMENT FOUND
- 5/8" REBAR PROPOSED
- 4"x4" GRANITE MONUMENT PROPOSED
- UTILITY POLE
- GUY ANCHOR
- OVERHEAD UTILITY LINE
- BELOW GROUND ELECTRIC
- LIGHT
- HYDRANT
- WATER VALVE
- WELL
- MONITORING WELL
- UNDERGROUND WATER LINE
- SIGN
- SURVEYED LINE
- STOCKADE FENCE
- WIRE FENCE
- GUARDRAIL
- STONE WALL
- CATCH BASIN
- STORM PIPE
- SANITARY MANHOLE
- SANITARY PUMP STATION
- SANITARY LINE
- SETBACK
- FLAG
- TEST PIT
- CONIFEROUS TREE
- DECIDUOUS TREE
- VEGETATION
- APPROXIMATE WETLANDS
- Fly James Brown — PRIOR OWNER

THIS PLAN PRELIMINARY WITHOUT SIGNATURE

STATE OF MAINE — KANE P. COFFIN #1292 — PROFESSIONAL LAND SURVEYOR

E.S. COFFIN ENGINEERING SURVEYING © 2014
E.S. COFFIN ENGINEERING & SURVEYING, INC.
432 Cony Road P.O. Box 4687 Augusta, Maine 04330
Ph. (207) 623-9475 Fax (207) 623-0016 Toll Free 1-800-244-9475

NO.	REVISIONS	DATE

SHEET TITLE: BOUNDARY & TOPOGRAPHIC SURVEY
SCALE: 1 INCH=30 FEET
DATE: JANUARY 16, 2015
DRAWN BY: KPC
CHECKED BY: MJG
CLIENT/PROJECT: STAGING AREA BADJ PROPERTIES, LLC
LOCATION: 79 LIPMAN ROAD
TOWN: AUGUSTA COUNTY: KENNEBEC STATE: MAINE
PROJ. NO. 2014-281

SH 1

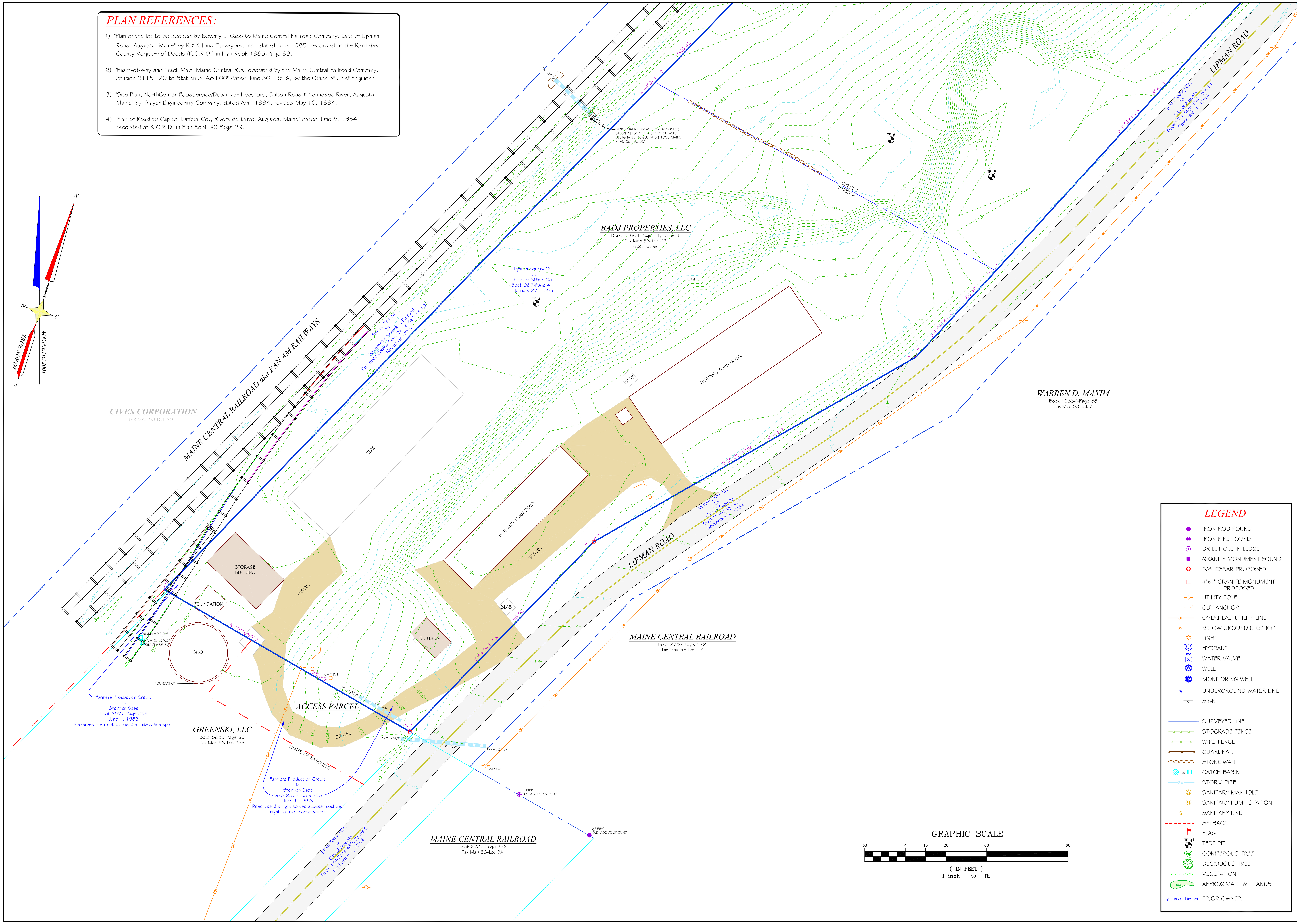
PLAN REFERENCES:

1) "Plan of the lot to be deeded by Beverly L. Gass to Maine Central Railroad Company, East of Lipman Road, Augusta, Maine" by K & K Land Surveyors, Inc., dated June 1985, recorded at the Kennebec County Registry of Deeds (K.C.R.D.) in Plan Rook 1985-Page 93.

2) "Right-of-Way and Track Map, Maine Central R.R. operated by the Maine Central Railroad Company, Station 3115+20 to Station 3168+00" dated June 30, 1916, by the Office of Chief Engineer.

3) "Site Plan, NorthCenter Foodservice/Downriver Investors, Dalton Road & Kennebec River, Augusta, Maine" by Thayer Engineering Company, dated April 1994, revised May 10, 1994.

4) "Plan of Road to Capitol Lumber Co., Riverside Drive, Augusta, Maine" dated June 8, 1954, recorded at K.C.R.D. in Plan Book 40-Page 26.



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Kane P. Coffin

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LOCATION: 79 LIPMAN ROAD

TOWN: AUGUSTA COUNTY: KENNEBEC STATE: MAINE

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SH 2